THE ROLE OF CUSTOMER SERVICE IN A HIGHLY TANGIBLE BUSINESS-TO-BUSINESS MARKET

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ABSTRACT

Defining and measuring the quality of customer service has been a major challenge for business-to-business marketers. This research addresses the question whether an established instrument for consumer markets (SERVQUAL) can be used for understanding the role of customer service in the European nylon intermediates industry. To accomplish this objective, an in-depth literature review is accomplished followed by several expert panels adopting the instrument slightly. Based on a survey sample of 110 industry members collected with the 'drop and collect technique' the appropriateness of the tool to verify the anticipated structure is examined using reliability tests as well as exploratory and confirmatory factor analysis.

The findings suggest that even though various criteria for reliability and validity are met, the five-dimensional structure of the instrument cannot be recovered. The research questions the usefulness of the instrument for the European nylon intermediates industry despite it being originally anticipated to be applicable. However, the research emphasises that the instrument is a useful indicator for understanding the role of customer service based on individual items rather than on the instrument's dimensionality. It is demonstrated how the implementation in the nylon intermediates industry enables an organization to develop a greater awareness of customer service quality and how an enterprise gains an initial instrument to comprehend and improve this element of the offering. The thesis concludes by linking the results of the research with the discussion on service-dominant logic.

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LIST OF ABBREVIATIONS

ADF	Asymptotic Distribution Free
AG	Aktiengesellschaft
AGFI	Adjusted Goodness-of-Fit Index
AMOS	Analysis of Moment Structures
B2B	business-to-business
BL	business line
Bn	Billion
BU	business unit
CFI	Comparative Fit Index
COA	certificates of analysis
CRM	customer relationship management
DBA	doctor of business administration
DIN	Deutsche Industrienorm
E	Expectation
e.g.	exempli gratiā

Eds.	Editors
et al.	et alii or et aliea
etc.	et cetra
GFI	Goodness-of-Fit
GLS	Generalized Least Squares
GOF	Goodness of Fit Index
IT	Information technology
Jr.	Junior
KPI	Key Performance Indicator
Kt	kilo ton (1.000 metric tons)
ML	Maximum Likelihood
MSA	Measure of Service Adequacy
MSS	Measure of Service Superiority
Mt	metric ton
NBR	nitrile butadiene rubber
NFI	Normed Fit Index
OSQ	overall service quality
P	Perception

p.	Page
p.a.	per annum
PBT	Polybutylenterephthalat
PIMS	Profit Impact of Market Strategy
pp.	Pages
Q	Question
R&D	research and development
RATER	reliability, assurance, tangibles, empathy, and responsiveness
RMSEA	Root Mean Square Error of Approximation
S	Statement
SCP	Semi-Crystalline Products
SEM	Structural Equation Modelling
SRMR	Standardized Root Mean Residual
TLI	Tucker-Lewis Index
TQM	total quality management
USD	US Dollars
vs.	Versus
$\chi 2$	Chi-square

CHAPTER 1 – INTRODUCTION

In 1976 La Londe and Zinser (1976) directed academia and practitioners to the emerging field of customer service. Their article *customer service: meaning and measurement* is seen as the decisive factor for a vast quantity of research articles on customer service that appeared thereafter (e.g. Sterling and Lambert, 1989, Tucker, 1994). Additionally, Wouters (2004) states that many companies started adopting customer service as a crucial element of their marketing actions in the 80s and 90s. Nowadays customer service has become an essential tool for differentiation (Subramaniam, 2009) and has emerged in the eyes of practitioners as one of the few sustainable differentiators in today's hyper-competitive markets (Roy, 2007).

A growing stream of research supports the positive effects of customer service. Several studies have positively linked service quality with customer satisfaction (Crosby et al., 1990, Innis and La Londe, 1994, Leuthesser and Kohli, 1995) and satisfaction with financial performance (Fornell, 1992, Anderson et al., 1994, Fornell et al., 1996, Ittner and Larcker, 1996) while other studies have demonstrated that customer service directly affects financial performance (Chang and Chen, 1998, Vickery et al., 2003). Consequently organisations are aware of the possibilities that customer service has to offer in the arena of sustainable competitive advantage (Wouters, 2004).

In order to excel in the field of customer service, companies should, as Kisperska-Moron (1996) states, not only follow a proper strategy but they should also develop a constant measurement of that performance. Performance indicators for customer service in a business-to-business environment are scarcely used (Wouters, 2004) and much of the existing literature on service-quality assessment is based on research focussing on end consumers rather than businesses (Parasuraman, 1998).

Garvin (1988) postulates that from a managerial point of view, a concept such as service quality must be meaningful, actionable and measurable. Parasuraman, Zeithaml, and Berry (e.g., 1985), Zeithaml, Parasuraman, and Berry (1990) and Zeithaml, Berry and Parasuraman (1993) developed the well-known SERVQUAL scales as an instrument for measuring service quality in business-to-consumer markets. Over time the SERVQUAL survey instrument has evolved to be one of the most widely deployed techniques for deriving a measure of quality within service industries (Hart, 1996).

Hill and Motes (1995) state in 1995 due to its intangible nature and the complex processes involved, providing service requires a distinctly different approach to marketing. In industrial settings, services are often regarded as an add-on or as a necessary evil because a number of stakeholders believe that an intervention occurring beyond the actual sale is related to a defect in the product (Demset et al., 2003). While services organisations have recognised the importance of customer service in general, it is still a hugely untapped area in industrial markets (Soutar, 2001). Wouters (2004) therefore describes industrial organisations as struggling with the understanding of customer service and its value.

This observation was confirmed, when I, the researcher, received marketing, sales and customer service responsibility in a chemical company. There were numerous reports and KPIs measuring the quantity of products shipped, prices, margins etc. but neither a process nor a tool was in place to understand the quality of the customer service process. Additionally, the external appraisal of the company's service processes along with the work of the colleagues was unclear, since no structured feedback process or measurement existed on how customers perceive the service. After an industry-wide search it seemed that all companies in that particular segment refused to see customer service as an important management responsibility, and neither procedures nor measurement tools could be identified; customer service was considered more an activity rather than a strategic tool as observed by Byrne and Markham (1992). In contrary to this finding, Parasuraman (1998) stresses the importance of customer service in business-to-business markets.

The research addresses this contradiction by complementing the practice of management with the existing management theory on customer service and service quality. The research aims to reveal for the first time how customer service is valued in the European nylon intermediates industry and how the customer service of the analysed company is perceived in the market.

The results will enable the practitioners to better understand customer service quality and its value to the customers. The industry usually considers customer service and its quality as an inferior task and seldom management's focus is put on customers' expectation of the customer service that complements the actual transaction. Therefore, this research is of particular value from a managerial perspective in order to be able to enhance the management of competitive advantage in the sector.

Additionally, the thesis details a plan on how the analysis can be deployed to monitor the development of the service quality perception over time. This explains why the topic is highly suitable for a DBA thesis – it tackles an existing business challenge with an academically reliable approach while taking advantage of existing research. Here the research refers to the latest constructs from the customer service and service quality literature.

The conceptual basis of the work is embedded in the field of service quality and satisfaction literature. Theories of quality as well as satisfaction are analysed and evaluated. Thus one central pillar of this research is to leverage and transfer the work of Parasuraman, Berry, and Zeithaml on service quality. This is of particular interest from an academic perspective, as the work of Parasuraman, Berry and Zeithaml, which focuses generally on business-to-consumer transactions, will be validated and respectively applied in a highly tangible and transaction orientated business-to-business environment - for the first time in academic research. Therefore, the research utilises and analyses the work of Parasuraman, Berry and Zeithaml in an untapped business setting and evaluates the model's usefulness and applicability in a specific market environment.

1.1 Business Context

The chemical industry is seen as a traditional and almost conservative industry. The players focus their business on tangible assets, like raw materials and finished

products, plants and equipment. Service or service offerings - even though they start to emerge - are rarely seen in the industry (Smolka, 2009).

When the researcher gained responsibility for the process of marketing, sales and customer service in the chemical company Lanxess, it became apparent that the above assessment is understandable. Processes during the day to day business supported the observation. Many reports were available on how much product was shipped, at which price, and at which margin etc. but neither a report nor a tool were in place to understand the quality of the customer service.

In order to rightfully address this observation it is required to describe the general business context in greater detail. The next two chapters offer the necessary descriptions of the business and market context.

Due to major restructuring at Bayer AG, a 163-year old German industry giant, Lanxess was floated on the stock market on January 31st 2005 as a demerger of almost the whole chemical and about one third of the polymer activities of Bayer. These activities constituted a rather mature part of the Bayer portfolio and hence were no longer in line with the strategic focus of the R&D intensive pharmaceutical, crop science and advanced materials businesses (Lanxess 2006).

With revenues of about €6.6 billion for the 12 months ended September 30, 2008, Lanxess manufactures and markets a diverse line of polymers and base, commodity, and specialty chemicals. Key end-markets include the automotive, tire, construction, and agrochemical industries. The company is organized as 13 business units across three business segments.

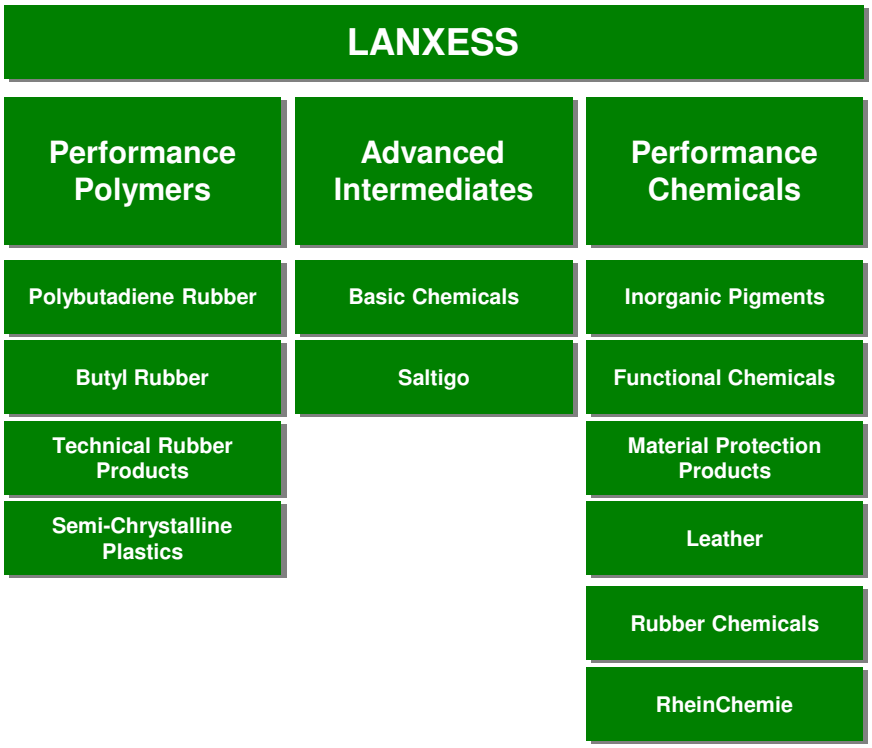


FIGURE 1: REPORTING STRUCTURE LANXESS

Standard & Poor's (Mock, 2009) highlights Lanxess' business set-up in their January 26th 2009 RatingDirect as follows and states:

Performance Chemicals

Lanxess operates in seven different areas of products mainly used in the food and beverage, leather, and plastics industries. The majority of the end-markets are sensitive to the weakening economic environment and especially the leather business is expected to have a challenging time ahead. The material protection products unit is expected to perform somewhat better, as it produces biocides and cold water sterilization products for use as wood protection or in the beverage industry, and

industrial preservatives for other end-markets. The ion-exchange resins unit also yields strong operating margins. These are used for the processing of water, foods, and chemicals. The third unit in this segment is RheinChemie, which makes chemical specialties for the rubber, lubricant, polymer, and polyurethanes industries. Functional chemicals include an assortment of products, such as plastic additives, flame retardants, water chemicals, specialty dyes, and colorants. Lanxess holds a top-three position in the leather business, and enjoys a competitive advantage of being backward integrated due to its own chrome ore mines. Rubber chemicals produces products including antioxidants, accelerators, and specialties, all applied in the tire and technical rubber industry. Inorganic pigments, reallocated from advanced intermediates under the new segment structure, are used as colour for concrete products, paints, coatings, plastics and paper (Mock, 2009).

Advanced Intermediates

Within this segment, the basic chemicals division accounts for the majority of sales and produces both aromatic and non-aromatic materials. Lanxess benefits from large-scale plants and is the world market leader for a high proportion of aromatics. Saltigo, Lanxess's fine-chemicals business, is the second division in the segment. Lanxess is particularly strong as a custom manufacturer of agrochemical ingredients and has a smaller custom manufacturing unit for pharmaceutical companies. Saltigo's performance during the first nine months of 2008 was good mainly due to solid demand from agro and precursors for the pharma industry. Healthy demand in crop protection and volumes from Asia supported the basic chemicals business unit (Mock, 2009).

Performance Polymers

Lanxess is the second-largest producer of butyl rubber and a leading producer of halobutyl rubber. Both products are used in tire making and other industries. Polybutadiene rubber is used principally in tire compounds. Lanxess, market leader in the merchant markets and second-biggest producer, faces its strongest competition for parts but not the entire product portfolio from Chinese products. Technical rubbers are Lanxess's third division in the segment. The semicrystalline products business provides a range of mainly polyamide and PBT (Polybutylenterephthalat) plastic components to the automotive and electrical industries and benefits from a favorable demand-supply balance, backward integration, and long-term supply contracts (Mock, 2009). It is this Business Unit (BU) where the research is being conducted.

The BU Semi-Crystalline Products (SCP) produces Durethan A®, Durthan B®, and Pocan® for the automotive and electronics industries. Due to its efficient production facilities and intensive product and application development processes, the Business Unit is one of the most important suppliers in Europe. The mentioned main products are further supported by the production of the relevant intermediates such as caprolactam, adipic acid as well as glass fibre for reinforcement purposes (Meier, 2007). This group of products is clustered as Nylon Intermediate Products

Since the beginning of 2007, the business unit Semi-Crystalline Products is structured in 5 Business Lines (BL) as indicated in the following illustration.

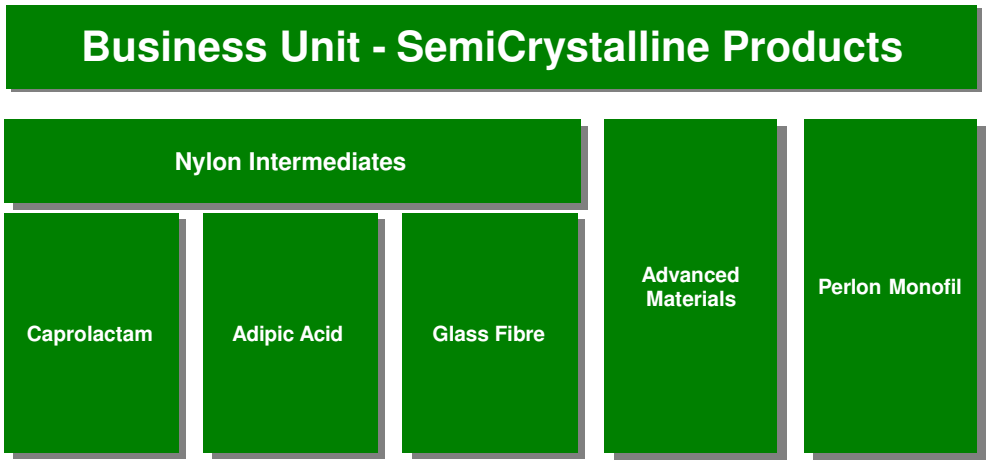


FIGURE 2: ORGANISATIONAL SETUP BU SCP

The Nylon Intermediates group – which is the business setting of this thesis – employs around 900 people and accounts for annual sales of approximately €500m. These are generated by the main products caprolactam, adipic acid, and glass fibre as well as through by-products such as Ammonium Sulphate, Hydrogen and Sulphuric Acid. Lanxess operates plants and facilities for caprolactam and glass fibre in Antwerp, Belgium, and for adipic acid in Uerdingen, Germany.

As a backward integration, the primary strategic goal of the three business lines is to cover the captive demand within the business unit (Advanced Materials) and to profitably market additional material externally. The ratio between captive and merchant sales is 2 to 3. Since the business lines caprolactam, adipic acid and glass fibre follow a similar business and market approach it was decided to lift synergies by setting up a shared logistical as well as customer service department. The analysis and understanding of customer service quality in this setting is key to the research.

1.2 Organisational Problem

For the above described backward integration the researcher gained responsibility for the process of marketing, sales and customer service. After taking over the responsibility it became apparent that service in this department was regarded as an add-on or as a necessary evil because a number of colleagues believe that an intervention occurring beyond the actual sale is related to a defect in the product. This observation was enhanced in the daily work since many reports were available on how much product was shipped, at which price, and at which margin etc. but neither a report nor a tool was in place to understand the quality of the customer service. Neither a structured feedback process nor any measurement tool was present to understand how the customers perceive the service. On the other hand the costs of the customer service department, including headcount as well as IT expenditures were well documented.

Additionally, qualitative questions were raised related to how important customer service is in general and how service quality is valued by customers. Moreover, it was questioned whether customers regard the service as good or bad and how the service offering has developed over time. Queries also included whether Lanxess holds any special strengths or weaknesses regarding to its service offering.

After an industry-wide research in the European nylon intermediates market it seemed that all companies refuse to see customer service as an important management responsibility as neither procedures nor measurement tools were existing; customer service was considered more an activity rather than a strategic tool as observed by Byrne and Markham (1992). To understand the market dynamics

and the competitive position of Lanxess, the market setting is detailed in the next chapter.

1.3 Market Setting

The nylon intermediates market is characterised by interactions between companies (business-to-business) with a high concentration of buyers and sellers (MacDonald, 2008). Caprolactam, adipic acid and glass fibre products are used to produce a wide range of different end-use products. The following illustrations demonstrate the wide variety of uses for nylon and its intermediates:

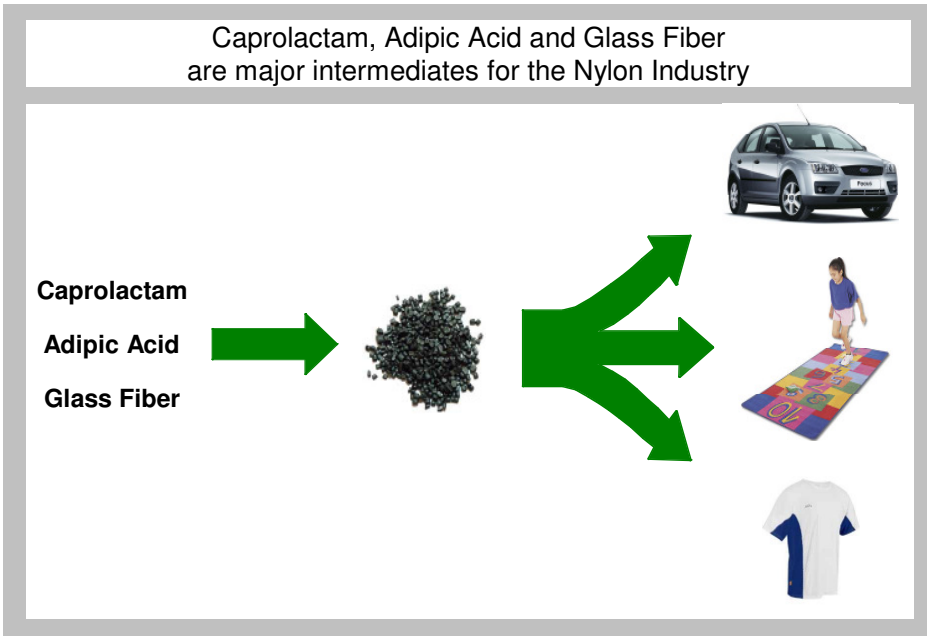


FIGURE 3: NYLON VALUE CHAIN

Caprolactam is a white, crystalline solid that is primarily used in the production of nylon fibres (about 60-70% of demand) and resins, which are made into textile, carpet and industrial yarns as well as engineering plastics. Caprolactam is usually

shipped in molten form (26mt/truck), but can also be flaked for shipments to small customers and for export (Tefera, 2006).

In 2005, the global demand for caprolactam reached almost 3.9 kt. The European consumption decreased in the past years as European textile companies are loosing business to cheaper imports from Asia (MacDonald, 2008). On a global basis, caprolactam demand is decreasing in the nylon filament production (minus 3-4%), but growing in nylon engineering resins (plus 3-5%) due to higher demand in the automotive industry. This trend is expected to remain the same in the future, with a slight overall growth in Europe (1% p.a.) and globally (2-2.5% p.a.) (Tefera, 2006).

In Western Europe, the 2005 production was 915,000mt, whereas consumption was 710,000 mt, spread over roughly 20-30 major customers. The excess production is mainly exported to Asia, the largest caprolactam consuming region in the world. Although demand is still increasing, the major issue for European caprolactam producers is how fast Asian countries, particularly China, build new capacities to cover for their net imports which currently represent 48% of their consumption (MacDonald, 2008). Because of this and global operating rates averaging about 87% in 2005, there should be no motivation for European companies to significantly increase capacity in the medium term (Tefera, 2006). Additionally, imports to Europe are on a negligible level. Overall, the European supply-demand-situation can be described as balanced (MacDonald, 2008).

The European caprolactam market is an oligopoly with 5 key players as listed (MacDonald, 2008) below:

Main Caprolactam Producers Europe in 2007	
BASF	465,000 mt
DSM	275,000 mt
LANXESS	200,000 mt
DOMO CHEMICALS	150,000 mt
UBE CHEMICALS	95,000 mt

TABLE 1: PRODUCTION CAPACITY CAPROLACTAM EUROPE 2007

In 2005, SRI (Tefera, 2006) global demand for adipic acid was 2.7 million metric tons. By the end of 2006, global demand for adipic acid is forecasted to be 2.8 million metric tons. The major markets for adipic acid are in use as feedstock for nylon 66 fibers and resins, polyester polyols and plasticizers. Globally, the nylon fiber and engineering resin markets account for 63% of total consumption of adipic acid in 2005. These markets are almost entirely captive, with INVISTA and Solutia dominating the markets in North America; Rhodia, INVISTA and BASF are the top producers in Western Europe; and Asahi Kasei dominating the Japanese market. Globally, the polyester polyols market accounts for 21% of the total consumption of adipic acid and the plasticizers market accounts for 7%. In Western Europe, consumption of adipic acid for nylon 66 fibers, nylon 66 engineering resins and polyester polyols will grow at an average rate of approximately 2% per year during 2005–2010 distributed over 30-40 major customers. Similarly to the caprolactam market major parts of the European adipic acid production are shipped to Asia.

The European adipic acid market is an oligopoly with about 5 key players. They are listed (MacDonald, 2008) below:

Main Adipic Acid Producers Europe in 2007	
Rhodia	290,000 mt
BASF	270,000 mt
Invista	260,000 mt
Radici	160,000 mt
LANXESS	100,000 mt

TABLE 2: PRODUCTION CAPACITY ADIPIC ACID EUROPE 2007

The glass fiber industry is highly diversified. The use of glass fibers as reinforcement in thermoplastic polymers like polyamides, polyesters and polypropylene yields materials with very attractive properties. This E-glass fiber is defined by DIN 1259 as an aluminum borosilicate glass with an alkali content of less than 2% by weight. Glass fiber-containing thermoplastic compounds show high strength and stiffness while maintaining a high level of impact strength. Combined with their low specific weight, ease of processing and tailor-made properties, these materials find widespread use in automotive applications, household and electronic appliances.

In summary it can be stated that the European nylon intermediates market is characterised through a high concentration of buyers and sellers. Further it is clear that overcapacities exist and that supply and demand are balanced only through major exports to Asia. The overall market growth is considered to be moderate or even only stable, since an improved demand situation driven by the automotive industry is countered through a sharp decline in the textile and fiber industry in Europe. The threat of substitution exists, yet it is assumed that “easy” substitution (polyamide vs. polyester) has already taken place. Therefore, the risk of further landscape-changing substitutes is regarded as limited. The power of buyers has improved considerably in the last decade. This is based on an intense consolidation

process leading to fewer yet bigger buyers. Additionally, customers know that sufficient material is available in Europe and that often the only opportunity for the nylon intermediates company is to export the material at a lower price to Asia.

One of the major raw materials is benzene - a derivative of crude oil - raw material pricing for the European nylon intermediates industry is not depending on the demand in the specific industry, but on the global demand for crude oil. Nevertheless there are more than five possible suppliers and therefore the power of suppliers is regarded as moderate. The risk of new entries in the European nylon intermediates market is low. An investment of nearly 1 bn USD i.e. for a caprolactam complex seems unattractive in a regionally oversupplied market. In summary the market can be regarded as very competitive, which is in line with the judgement of Robin MacDonald (2008) who is regarded as the leading expert in the European nylon intermediates market.

Lanxess itself is regarded as a well-established market player (MacDonald, 2008). Pricing and quality of the products are seen in line with the market and no core advantage derives from either attribute for Lanxess (MacDonald, 2008). An internal study of the core competences for the business line caprolactam revealed that next to other competencies contract management, good people focus and good personal relationships, accompanied by accountability, transparency and clear responsibilities are key for the success of the business line caprolactam (Klein, 2007).

In this market setting the researcher wants to clarify Lanxess' competitive position with regards to customer service quality. The results of the analysis might provide the opportunity to enhance Lanxess' competitive advantage in the market place. In

order to achieve this, the thesis needs to develop and validate a measurement tool for the quality of Lanxess' service process. The research objectives outlined above are detailed in the following.

1.4 Research Objectives

As shown, the nylon intermediates market is a highly tangible business-to-business market and characterised by a high concentration of suppliers and buyers. More than 1,000,000 metric tons of nylon intermediates are sold yearly to roughly 60 customers in Europe, which represent 90 per cent of the total demand. This research focuses on Lanxess, a key supplier within this highly tangible transaction-oriented market, and addresses the strategic challenges of customer service and its quality. Parasuraman (1998) states that gaining customer satisfaction through providing superior customer service is especially critical in business-to-business markets. Parasuraman, Zeithaml and Berry developed a theory based on intensive research, which is widely applied and commonly used in business-to-consumer markets. This thesis aims at leveraging Parasuraman, Zeithaml, and Berry's SERVQUAL concept in the European nylon intermediates business and market setting with the following objectives:

- For the first-time, reveal how Lanxess' customer service is perceived by its customers and quantify these findings
- Evaluate service dimensions and assess which service dimension of the customer service process is considered to be of high or low importance for the customers

In order to extend the use of theory to a specific application and thus contributing not only to the practice of management but also to the application of theory, the thesis also has the following objectives:

- Develop and validate a slightly adapted SERVQUAL instrument for the nylon intermediate industry
- Assess the usefulness and adaptability of SERVQUAL as a tool in a low involvement, highly transaction oriented business-to-business market

Thus the overall aim of this thesis is to assess and to validate quality and satisfaction theory to enhance management of competitive advantage in the sector of the European nylon intermediate industry. In order to fulfil this aim a slightly adapted SERVQUAL instrument is developed and applied to foster the understanding of the applicability and robustness of the SERVQUAL scale in an untouched business-to-business setting. The study assesses the dimensionality, reliability, and validity of the SERVQUAL instrument.

After identifying a valid and reliable tool for measuring service quality in the European nylon intermediates industry, several challenges the researcher was confronted with can be directly addressed and answered. During the annual budget reviews the following questions were raised:

- What do nylon intermediates customers expect from Lanxess in terms of the way the company provides customer service?
- How can customer service quality be reliably measured?
- Overall, are customers satisfied or dissatisfied with the way customer service is provided and developed over time?

- What do service-users perceive to be the areas of strength and weakness in the company's customer service performance?

Thus the thesis' approach assures to bring management theory and the practise of management together. The perceived inadequacy of existing quality and satisfaction theory and its managerial use in a highly tangible business-to-business environment is another motivation and directly addressed.

The research combines the SERVQUAL approach with findings of the customer service research, which is mainly derived from the landmark study of La Londe and Ziner (1976). Customer service is considered to consist of more than only on time deliveries and general product availability; it is primarily a way of providing an optimal overall process for the customers (Wouters, 2004). Hise and Gabel (1995) found that customer service could serve as a strategic weapon even in international industrial systems, while Lovelock and Yip (1996) argue that service management is taking on greater international significance in the development of global strategies. Special focus is put on the originators of SERVQUAL, how they addressed the generalisability of their model and how they suggested it shall be used in other sectors.

The next section details the theoretical background of the research path, summarises the literature and names challenges during the research process. Focus is put on the theories of quality and satisfaction that can be evaluated as valid and reliable to be tested and used in the European nylon intermediates sector. In the course of the section the SERVQUAL model is discussed in detail and its generalisability. Afterwards, the thesis outlines the research methods, the data collection as well as

the data analysis techniques. Hereby special attention is put on the factor analysis approach as proposed by Parasuraman, Zeithaml and Berry (1990).

CHAPTER 2 – MEASURING AND MANAGING QUALITY AND SATISFACTION IN SERVICES

This chapter provides an overview of the relevant existing literature. It highlights theories of quality and satisfaction that are evaluated as valid and reliable that can be tested and used in the sector of the European nylon intermediates industry. At the beginning of the chapter the terms *quality* and *service quality* are introduced. This is a necessity to clarify the basic concepts of service and service quality for the course of the research. Additionally, reference is made to different studies that analyse why quality is of immense importance to the success or failure of a company. Secondly, the *Gap Model of Service Quality* is defined and presented. Relevant works from several academics such as Parasuraman, Zeithaml and Berry as well as Grönroos are discussed to underpin the later focus on SERVQUAL and its model and to provide a broad and common understanding of the underlying concept. Further this chapter gives an overview of discussions and critiques concerning the five identified service gaps that are stated and analysed.

Thirdly, this chapter introduces the concept of SERVQUAL. It details the development of the SERVQUAL model and its authors' thinking. Focus is placed on the five dimensions responsiveness, assurance, tangibles, empathy and reliability. Attention is given to the questionnaire, in which respondents are asked to rate expectations and perceptions on a seven-point Likert scale for 22 statements. Different applications of SERVQUAL are listed and the relevant literature is

structured and presented. A detailed literature review of the areas of application is needed to demonstrate and highlight the novelty of using SERVQUAL in a low involvement business-to-business setting such as the European nylon intermediates industry. Further, this chapter details and clusters existing shortcomings and critique of the SERVQUAL research approach. Several academic disputes are outlined and summarised in order to take these proactively into consideration when setting up the research.

Finally, the chapter provides a review of the existing literature on customer service. It is demonstrated that the academic literature offers a wide range of definitions and postulates. This is especially required to set a common literature understanding of customer service and to provide clarity of the concept's entirety. Therefore, a definition of customer service – valid for this research – is stated at the end. The chapter closes by giving a focused summary.

2.1 Service Quality

The central link in most service discussions is quality, which has been a major issue for many years, dating back at least to Deming's (1982) work in Japan in the 1950s. Thoughts about total quality management (TQM) have been intensively developed over the last forty years. Crosby (1979) for example states in his highly recognised book *Quality Is Free* that quality needs to be the central part of a company's operations. However, most of the early work on quality was limited to products.

Shostack's (1977) seminal article *Breaking free from product marketing* marked the beginning of a move away from the adoption of product-oriented strategies by service firms. However, even in the late 80s Gummesson (1989) identified that only three of the 145 papers presented at the 1988 American Society for Quality Control included 'services' in their titles, while none of the 102 papers at the 1987 European Organisation for Quality Control alluded to 'services'. Despite that, many organisations operating in service areas have realised that quality is essential (eg. Peters, 1992, Berry, 1980, Edvardsson and Gustavsson, 1991). While service organisations have recognised the importance of quality in general, service quality is still a major problem that is only rarely addressed. Soutar (2001: 99) lists six reasons:

1. Many managers have a short-run view of the world, especially when organisation systems are designed to reward short-, rather than long-term achievements. Quality programs have financial and human resource costs, especially when first developed, which is a major problem if such resources are in short supply […].

2. Many organisations offer too many services. With limited budgets this often means that nothing within the organisation can be done excellently. However, pruning activities can be an extremely difficult issue […].

3. Existing operating systems may not be efficient or effective. […]. Often, systems are also expensive to repair or replace, making choices in this area difficult.

4. Reasonable status may not be given to the "frontline troops" […]. Consequently, these people have little job satisfaction or organisational loyalty and are not inclined to exert themselves for their organisations when it might be required.

5. An "it's not my job" syndrome exists in many organisations, which means people try to avoid helping instead of providing support to customers […].

6. Staff thinks "customers are a nuisance", making it difficult to develop strong customer service programs, as they have other agendas.

Despite these boundaries, Soutar (2001) states that service quality is to be assessed and must be operationally defined. Buzzell and Gale (1987: 111) suggest "quality is whatever the customer says it is and the quality of a particular good or service is whatever the customer perceives it to be". Even though the strategic benefits of providing high levels of service quality are well documented in the literature (e.g. Berry and Parasuraman, 1993) a commonly accepted definition of service quality does not exist. Joseph Cronin Jr. and Steven Taylor (1992) state that service quality is an elusive and abstract construct that is difficult to define.

Nevertheless, service quality in the context of this research is defined as the consumer's judgment of an entity's overall excellence or superiority (Zeithaml, 1981). It includes the manner in which a service is delivered (Grönroos, 1984) as well as the company's image or profile, and the interaction between the service provider and the customer (Lehtinen and Lehtinen, 1982). Moreover, it takes into account the focus on quality, total quality management, and customer satisfaction as alluded to by Fisk et al. (1993).

Organisations must have a good understanding of their customers if they are to comprehend their quality perceptions or to have a chance of successfully implementing service quality programs. They also need to identify how and when a customer interacts with their organisation and its various operations (Soutar, 2001). Carlzon (1987) has been accredited for analysing and identifying these "moments of truth". He argues that the first phase in understanding service quality is to define these moments of truth and to determine how they can be mismanaged. Shostack (1984) suggests an approach to developing such an understanding with her "blueprinting" concept, which examines interactions from a customer's viewpoint.

Hence, some researches have viewed customer satisfaction as a transaction-specific event and an antecedent of service quality (Bitner, 1990). However, other researchers have provided empirical evidence to support that customer satisfaction is a cumulative evaluation and a consequence of service quality (Cronin Jr. and Taylor, 1992).

In summary, the service quality research has its foundation in early conceptual work conducted in Europe (eg. Lehtinen and Lehtinen, 1982, Grönroos, 1984), and in customer satisfaction theory (Oliver, 1980). It has received considerable attention of researchers, and Hoffman and Bateson (1997) believe service quality to be the currently single most researched area. Various researchers have developed models of service quality; five of the key models include, in chronological order: the disconfirmation of expectation model (Oliver, 1980, Oliver, 1977, Oliver, 1981); the Grönroos model (1984); the SERVQUAL/Gaps model developed by Parasuraman, Zeithaml and Berry (1985, 1988, 1991); and the three-component model developed by Rust and Oliver (1994). More recently, researchers (Brady and Cronin Jr., 2001) have focused on integrating the perspectives of these four service quality models in an effort to extend current thoughts regarding service quality. This thesis as detailed later will focus mainly on the work of Parasuraman, Berry and Zeithaml and hence does neither describe nor analyse the work of the above quoted researchers separately.

2.2 The Gap Model

Wyckoff (1984) demonstrates that service quality cannot be determined from within an organisation, since quality is about meeting consumers' needs. If an organisation's knowledge about its customers is limited, then it will find it extremely difficult to meet them. The knowledge about a customer's service needs is very limited within the investigated European nylon industry. Nevertheless, at some point in time, an organisation such as Lanxess must understand how it is viewed in the marketplace which will then enable the organisation to measure its service quality over time and optimize it.

The major development of the service quality research can be credited to Ananthanarayanan Parasuraman, Leonard Berry, and Valerie Zeithaml (Fisk et al., 1993). Their ongoing research has produced a well-received conceptual framework (The Gap Model of Service Quality) and a measurement instrument (The SERVQUAL), for assessing service quality in organisations. The conceptual framework of their service quality model is explained below. Its components are essential in understanding the basic principles of the SERVQUAL model, which is analysed within the upcoming chapters.

The **Gap Model Of Service Quality** for organisations was developed in 1985 by Parasuraman, Zeithaml, and Berry. In this early research, Parasuraman et al. (1985) suggest that service quality is the discrepancy or "gap", between the consumers' perception of a company's performance and the expectations concerning those services. Service quality is modelled as a function of the comparison between

perception and expectations of the service experience (Parasuraman et al., 1985). The basic concept of this model can be illustrated as follows:

FIGURE 4: SERVICE QUALITY

Parasuraman, Zeithaml and Berry (1988: 16) define perceived quality as 'a global judgement, or attitude, relating to superiority of the service'. In addition, they link to the concepts of perception and expectations as follows: 'Perceived quality is viewed as the degree and direction of discrepancy between consumers' perceptions and expectations' (Parasuraman et al., 1988: 1). In the services marketing literature, Teas (1993) explains in his highly recognized article *Expectations, Performance Evaluation, and Consumers' Perceptions of Quality*, perceptions (P) are defined as consumers' beliefs concerning the service perceived (Parasuraman et al., 1988) or experienced service (Brown and Swartz, 1989). Further expectations (E) are defined by Parasuraman, Zeithaml and Berry (1988: 17) as 'desires or wants of consumers, i.e., what they feel a service provider should offer rather than would offer'. This definition of expectation, Teas (1993) highlights, is somewhat vague in terms of the meaning of 'should'. However, Parasuraman, Berry and Zeithaml (1990: 12) note that the service expectations concept is 'intended to measure the customers' normative expectations', and that these expectations represent an 'ideal standard' of performance.

The operationalisation of the quality concept in empirical studies (e.g. Parasuraman et al., 1986, Brown and Swartz, 1989, Carman, 1990) suggests that perceived service quality can be conceptualised with the function P-E, as illustrated in Figure 4. This gap idea is also a critical part of the 'disconfirmation' approach to measure both quality and satisfaction. If performance rates below a customer's expectation, quality is perceived to be insufficient which leads to dissatisfaction (Parasuraman et al., 1988). If performance meets or exceeds customers' expectations, quality is perceived to be high resulting in satisfaction.

In their 1985 Service Quality Model, Parasuraman et al. identify a set of key discrepancies or otherwise related to as service quality "gaps" regarding executive perceptions of service quality and the tasks associated with service delivery to consumers. Parasuraman et al. (1985, 44) postulate "these gaps are considered major hurdles in attempting to deliver a service which consumers would perceive as being of high quality". Zeithaml et al. (1988) expand upon their original service quality model (Parasuraman et al., 1985) by deriving theoretical constructs form the organisational behaviours and marketing literature (Hoffman and Bateson, 1997). They identify 16 constructs and describe their relationships to the gaps in their service quality model. As a result the original Service Quality model was renamed *The Extended Model of Service Quality*, which is still often referred to as *The Gap Model* or *The Gap Model of Service Quality*.

Figure 5 diagrams the gaps in the gaps model of service quality:

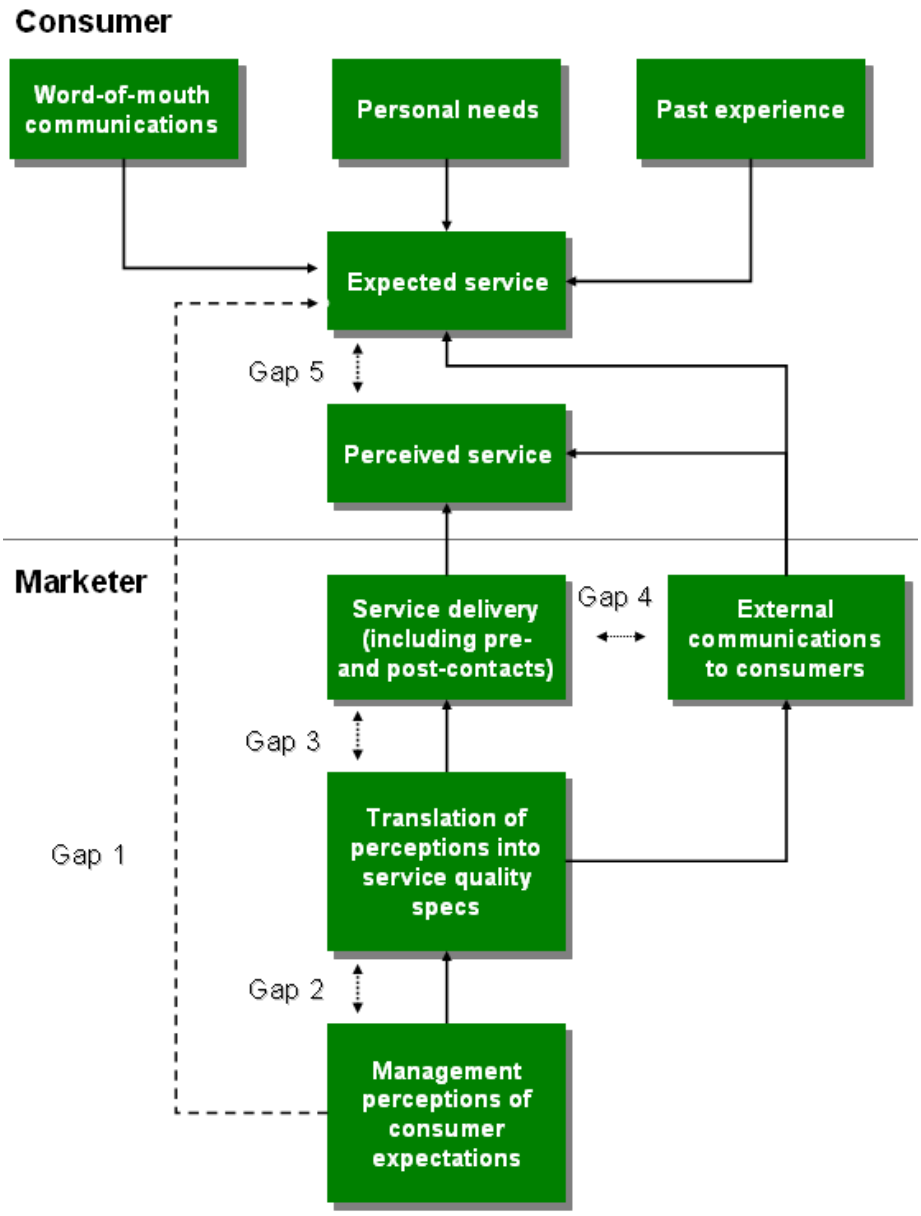


FIGURE 5: THE 5 GAPS MODEL

Dagger and Lawley (2002) state that the gaps model serves as a useful diagnostic tool for evaluation why service quality is failing and is comprised of two primary sections. The first section, comprised of gaps that are aimed at management, reflects potential service failure as a result of management actions. These gaps provide a framework for management to understand the causes of service failure (Soutar, 2001). The second section, or fifth gap, occurs at the consumer level. This gap suggests that the difference between expected and perceived levels of service derives

from the consumers' overall perception of service quality. It is this gap that is the central focus of the gaps model. SERVQUAL exactly measures this fifth gap (Parasuraman et al., 1988).

This Gap 5 identifies service performance problems but does not determine the cause of these problems. The four other gaps help management to understand where service quality has failed (Zeithaml and Bitner, 1996). Companies that want to improve their performance need to close the gap between customers' expectations and perceptions of the actual service received. To do this, the model suggests that the four provider gaps need to be closed (Parasuraman et al., 1985). The 5 gaps are explained and judged by Parasuraman et al. (1985) and Dagger and Dawley (2002) as follows:

Gap 1 is the difference between consumer expectation and management's perception of consumer expectation. For example management does not understand what the customer expects. This results in service design and delivery that does not match the expectations of consumers. Therefore the size of Gap 1 is related to (a) extent of marketing research orientation, (b) extent and quality of upward communication, and (c) levels of management.

Gap 2 is defined as the difference between management perceptions of customer expectation and service quality specification. The management might fail for example to design the service standards that meet the customer's expectations. Hence the size of Gap 2 is related to (a) management commitment to service quality, (b) setting of goals related to service quality, (c) task standardisation, and (d) perception of feasibility for meeting customer expectations.

Gap 3 is the difference between service quality specifications and the service actually delivered. For example the people, processes and systems fail to deliver the service to the necessary standards. Several issues determine therefore the size of Gap 3. (a) the extent of teamwork perceived by employees, (b) employee-job fit, (c) technology-job fit, (d) extent of perceived control experience by customer-contact personnel, (e) extent to which behavioural control systems are used to supplement output control systems, (f) extent of role conflict experienced by customer contract personnel, and lastly (g) extend of role ambiguity experienced by customer-contact personnel.

Gap 4 can be understood as the difference between service delivery and what is communicated about service to the consumers. The size of Gap 4 relates to (1) the extent of horizontal communication and (b) propensity to over compromise. The promises made by the organisation in external marketing communications do not match actual service delivery.[1]

Gap 5 represents perceived service quality and is the difference between consumer expectations and perceptions and depends upon the size and direction of the 4 Gaps on the providers side associated with the design, marketing, communication and delivery of services. The quality is a function of magnitude and direction of the gap between expected service and perceived service. Gap 5 reveals where and to which extent the customer's perception of the service experience does not match their expectations of the service performance and outcome.

[1] A detailed description of the key factors leading to the provider gaps can be found in Zeithaml and Bitner (1996, 49).

In summary, the lower part of the model reveals Gap 1 to 4 which are influenced by the marketer or service provider. Gap 5 represents service quality as perceived by the consumer. Perceived service quality, thus, depends on the size and direction of Gap 5 which in turn is proposed to be a function of the first four gaps (Parasuraman et al., 1985). Several authors have tried to "brand" the different service gaps. For example Hoffman and Bateson (1997) call the five gaps: Knowledge-, Service-, Standard-, Delivery-, and Communication-Gap. Nevertheless the numeric naming of Parasuraman et al (1985) remains widely accepted.

Grönroos (1990) adds the importance of image in the generation of quality perception. If a service provider has a good image then small service gaps are more likely to be accepted. However, if there is already a poor image, even small gaps are likely to create negative quality perceptions. Soutar (2001) elaborates on Grönroos' (1990) findings and states, if gaps remain, previously good images are likely to be overturned, resulting in negative long-term consequences. Even excellent service providers cannot endlessly live off their reputation. Companies with relatively poor images will find it harder to obtain a good perception and will need to be extremely vigilant about service quality.

The gap model provides a useful guide to understanding quality problems. Brown and Swartz (1989, 87) find the Gap analysis to be a straightforward and appropriate way to identify inconsistencies between provider and client perceptions of service performance. Addressing these gaps seems to be a logical basis for formulating strategies and tactics to ensure consistent expectations and experiences, thus increasing the likelihood of satisfaction and a positive quality evaluation

The gap model therefore emphasises that managers must understand what customers expect from the service experience. The management must also understand the barriers that prevent the firm from meeting the requirements of its customers. In order to identify the key dimensions, upon which consumers evaluate service providers, Parasuraman et al. (1985, 1986, 1988) and Zeithaml et al. (1990) conducted a series of empirical studies to determine the underlying dimensions used by customers when assessing service quality.

2.3 The SERVQUAL-Model

SERVQUAL was originally proposed as a model to measure service quality by Parasuraman, Zeithaml and Berry in the mid 1980s (Parasuraman et al., 1985, 1988), based on US research in various service industries such as a repair company, a long-distance telephone company, a securities broker, several retail banks and credit companies. In 1991 the authors replicated their 1988 study, using two additional industries: fast food and dry cleaning. Based on the above described model, the SERVQUAL model assumes quality to be the result of gaps between consumers' expectations and their perceptions of service performance.

A first survey, conducted by a consulting firm, focuses on five different service industries. A set of 97 paired questions, expectations and perceptions of service quality is analysed by using multivariate analysis. The resulting ten dimensions of service quality were: tangibles, reliability, responsiveness, communication, creditability, security, competence, courtesy, understanding customers and access.

With subsequent studies and analyses (Parasuraman et al., 1988), SERVQUAL focuses on a set of 22 pair-questions giving rise to five dimensions: tangibles, reliability, responsiveness, assurance, and empathy (Figure 6). Courtesy, communication and understanding the customer appear to be reflective of assurance and empathy. The conceptual definitions of the five service quality dimensions in the SERVQUAL scale as described by Parasuraman et al. (1998) are:

Reliability refers to the firm's ability to deliver a promised service dependably and accurately (Parasuraman et al., 1988). Dagger and Lawley (2002) suggest the example of a taxi driver arriving promptly and taking the passenger to the final destination safely and efficiently. Reliability is essential to the success of service firms.

Assurance refers to the knowledge and courtesy of employees and their ability to inspire trust and confidence (Parasuraman et al., 1988). For example, a lawyer is knowledgeable, skilled, qualified and has a good reputation. Assurance, Dagger and Lawley (2002) state, is particularly important in services that rank high in perceived risk and customer involvement. Service offerings with high credence qualities such as legal advice and assurance are an important dimension on which customers base their service quality perceptions.

Tangibles are the physical facilities, equipment and the appearance of staff (Parasuraman et al., 1988). A key example for this dimension is the appropriateness of an airline's airplane, ticketing information, check-in counters, arrival and departure lounges (Zeithaml and Bitner, 1996). Technically, tangibles create a physical presence that affects customers' sensory perceptions. Customers often have

to use physical evidence to analyse the quality of service. Tangible cues, Dagger and Lawley (2000) summarise, are readily available to consumers in most service settings and can make an intangible service seem more tangible. Thus tangible elements in the service delivering process serve as indicators of quality and are often used in conjunction with other dimensions to create the overall quality perception of an organisation.

Empathy is demonstrated by giving caring, individualised attention to customers (Parasuraman et al., 1988). Empathy can be explained as the provision of individual attention to customers by the service provider as well as the understanding and caring for the customer. In a service setting employees that understand consumer needs, listen to their concerns, are patient and anticipate customers' needs are likely to fulfil the dimension of empathy (Zeithaml and Bitner, 1996). Customers for example will not feel that a company's service quality is high if they do not believe that staff and the organisation have acted empathically towards them (Dagger and Lawley, 2002).

Responsiveness refers to the service provider's willingness to help customers and provide prompt service (Parasuraman et al., 1988). Responsiveness describes how quickly and appropriately customers' concerns, questions, requirements and complaints are dealt with. Service providers, for example a call centre agent, communicate responsiveness through the length of time they require customers to wait for assistance or for a response to their problems.

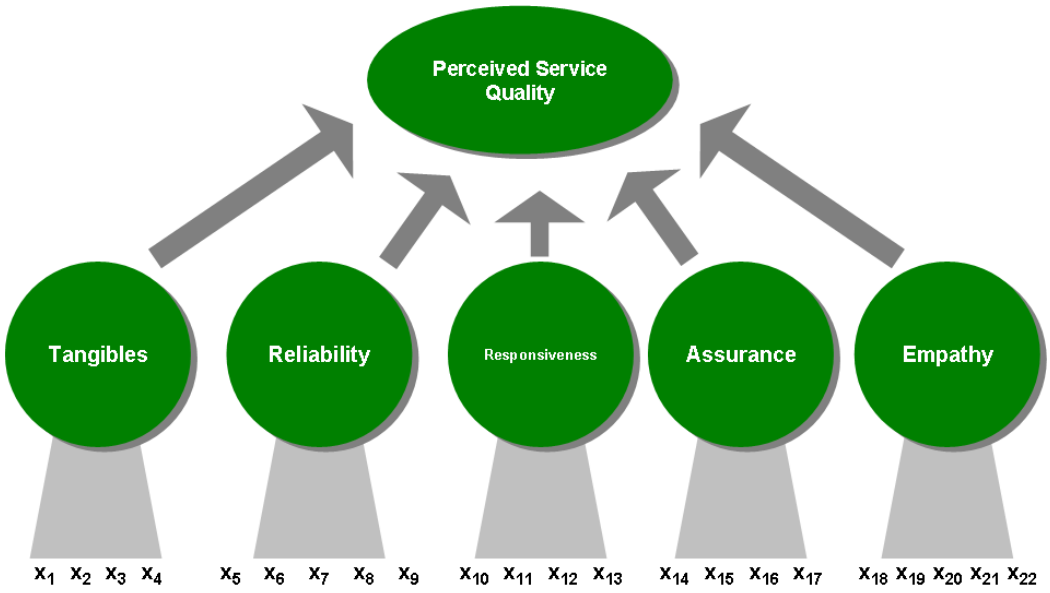


FIGURE 6: THE SERVICE QUALITY DIMENSIONS

In 1990, another academic, Grönroos, added a significant sixth dimension namely "recovery" to the existing five which describes the organisation's ability to rectify problems. More recently other academics have suggested additional criteria, some as many as 15 dimensions, but most practitioners are satisfied with the five SERVQUAL dimensions plus the important addition of recovery (Hill and Alexander, 2000).

Parasuraman et al. (1988) use the five identified dimensions of quality to develop a generic questionnaire. A standard questionnaire of 22 questions (4 or 5 for each dimension) measures customers' expectations and perceptions of the five RATER dimensions. The 22 questions are clustered in two sets: the first set aims at determining a customer's expectations of a service firm: for example, "they should have up-to-date equipment" (Parasuraman et al., 1988); while the second set seeks to ascertain the customer's perceptions of the company's performance: e.g. "XYZ has up-to-date equipment". The respondent is asked to rate his/her expectations and

perceptions of performance on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The two-part instrument with the 22 statements in the survey describes aspects of the five dimensions of service quality and asks the respondents the following (Parasuraman et al., 1988):

Please show the extent to which you think a firm's offering […] services should possess the features described by each statement. Do this by picking one of the seven numbers next to each statement. If you strongly agree that these firms should possess a feature, circle the number 7. If you strongly disagree that these firms should possess a feature, circle 1. If your feelings are not strong, circle one of the numbers in the middle. […]

Tangibles

- E1 They should have up-to-date equipment
- E2 Their physical facilities should be visually appealing
- E3 Their employees should be well dressed and appear neat
- E4 The appearance of the physical facilities of these firms should be in keeping with the type of service provided

Reliability

- E5 When these firms promise to do something by a certain time, they should do so
- E6 When customers have problems, these firms should be sympathetic and reassuring
- E7 These firms should be dependable
- E8 They should provide their service at the time they promise to do so
- E9 They should keep their records accurately

Responsiveness

E10 They shouldn't be expected to tell customers exactly when services will be performed (-)

E11 It is not realistic for customers to expect prompt service from employees of these firms (-)

E12 Their employees don't always have to be willing to help customers (-)

E13 It is OK if they are too busy to respond to customer requests promptly (-)

Assurance

E14 Customers should be ale to trust employees of these firms

E15 Customers should be able to feel safe in their transaction with these firms' employees

E16 Their employees should be polite

E17 Their employees should get adequate support from these firms to do their jobs well

Empathy

E18 These firms should not be expected to give customers individual attention (-)

E19 Employees of these firms cannot be expected to give customers personal attention (-)

E20 It is unrealistic to expect employees to know what the needs of their customers are (-)

E21 It is unrealistic to expect these firms to have their customers' best interest at heart (-)

E22 They shouldn't be expected to have operating hours convenient to all their customers (-)

The following set of statements relates to your feelings about XYZ. For each statement, please show the extent to which you believe XYZ has the feature described by the statement. Once again, circling a 7 means that you strongly agree that XYZ has the feature, and circling a 1 means that you strongly disagree. You may circle any of the numbers in the middle to show how strong your feelings are. […]

Tangibles

P1 XYZ has up-to-date equipment

P2 XYZ's physical facilities are visually appealing

P3 XYZ's employees are well dressed and appear neat

P4 The appearance of the physical facilities of XYZ is in keeping with the type of service provided

Reliability

P5 When XYZ promises to do something by a certain time, it does so

P6 When you have problems, XYZ is sympathetic and reassuring

P7 XYZ is dependable

P8 XYZ provides its services at time it promises to do so

P9 XYZ keeps its record accurately

Responsiveness

P10 XYZ does not tell customers exactly when services will be performed (-)

P11 You do not receive prompt services from XYZ's employees (-)

P12 Employees of XYZ are not always willing to help customers (-)

P13 Employees of XYZ are too busy to respond to customer requests promptly (-)

Assurance

P14 You can trust employees of XYZ

P15 You feel safe in your transactions with XYZ's employees

P16 Employees of XYZ are polite

P17 Employees get adequate support from XYZ to do their jobs well

Empathy

P18 XYZ does not give you individual attention (-)

P19 Employees of XYZ do not give you personal attention (-)

P20 Employees of XYZ do not know what your needs are (-)

P21 XYZ does not have your best interest at heart (-)

P22 XYZ does not have operating hours convenient to all their customers (-)

The results of the survey are then used to identify positive and negative gaps in the company's performance regarding the five service quality dimensions. The gap between expectations and performance perceptions (perceived service quality) is measured by the difference between the two scores (performance minus expectations). For each respondent the service quality for each dimension is calculated – Robinson (1999) summarises – as follows:

SQ [sub] j - Service quality of dimension j

E [sub] ij - Expectations of the firm item i in dimension j

P [sub] ij - Perceived performance of the firm on item i in dimension j

N [sub] j - Number of items in dimension j

An average score for each dimension is then calculated across all respondents. Also, an overall service quality score is calculated by taking the mean score for the five dimensions. Positive scores show better than expected service while negative scores show poor quality (Robinson, 1999). A zero score implies that quality is adequate (Parasuraman et al., 1988).

A more recent version of the instrument (Parasuraman, 1991) includes a third section that measures the relative importance of the five dimensions to the customer. Parasuraman et al. (1991) ask the respondent as follows:

The following set of statements relates to your feelings about the importance of each feature described in your decision to purchase […] services. A seven means you consider the feature very important in deciding where to purchase a service; a one means it is very unimportant. […]

Tangibles

I1 Up-to date equipment.

I2 Physical facilities that are visually appealing

I3 Employees that are well dressed and appear neat

I4 Physical facilities that appear to be in line with the type of service provided

Reliability

I5 When something is promised by a certain time, doing it

I6 When there is a problem, being sympathetic and reassuring

I7 Dependability

I8 Providing service by the time promised

I9 Accurate record keeping

Responsiveness

I10 Telling the customer exactly when the service will be performed

I11 Receiving prompt service

I12 Employees who are always willing to help customers

I13 Employees who are not too busy to respond the customer request promptly

Assurance

I14 Employees who are trustworthy

I15 The feeling that you are safe when conducting transactions with the firm's employees

I16 Employees who are polite

I17 Adequate support from the firm so employees can do their job well

Empathy

I18 Individual attention

I19 Employees who give you personal attention

I20 Employees who know what your needs are

I21 A firm which has your best interests at heart

I22 Convenient operating hours

These scores are then used to weight the perceived service quality measure for each dimension. Robison (1999) sees the reason for adapting the third section in providing a more accurate overall perceived quality score.

Additionally, in their 1991 follow-up study Parasuraman et al. (1991b) slightly refine their previous core work. The wording of all expectation items is changed and the 1988 wording of many perceptions items is also modified. Two new items, one for each tangibles and assurance, replace two previous items. The tangibles item refers to the appearance of communication materials. The assurance item refers to the knowledge of employees. Both references had been omitted in the 1988 version (Buttle, 1995).

Based on empirical tests with the SERVQUAL instrument and various theoretical considerations, Parasuraman et al. claim that SERVQUAL is both a reliable and a valid measure of service quality (Parasuraman et al.1988, 1991, Zeithaml et al. 1993). They also assure that the instrument is applicable to a wide variety of service contexts (Parasuraman, 1988), although it may be necessary to reword and/or augment some of the items.[2]

2.3.1 Usage and Applications

Since SERVQUAL is a practical and easily applicable tool for measuring and understanding service quality and consumers' perception, the SERVQUAL tool has been applied in several businesses and non-profit environments (Bateson and Hoffman, 1999). Before naming some of the areas where SERVQUAL has been used as not only an academic but also as a business tool, it is important to highlight the usage fields of SERVQUAL.

[2] However, Robinson (1999) summarises Parasuraman's et al. work (1991), neither the deletion of items nor the addition and removal of dimensions is recommended, since the integrity of the scale may compromised.

As described in the previous section, data obtained through the SERVQUAL instrument can be used to compute service-quality gap scores at different levels of detail: for each statement pair, for each dimension, or combined across all dimensions. By examining these various gap scores, Zeithaml et al. (1990) postulate, a company can not only assess its overall quality of service as perceived by customers but also identify the key dimensions, and facets within those dimensions, on which it should focus its quality improvement efforts. Zeithaml et al. (1990) list four generic usage fields of SERVQUAL:

Comparing Customers' Expectations and Perceptions over time. While analysing SERVQUAL scores (which represent the gap between customers' expectations and perceptions) can be insightful, additional insight can be gained by tracking the levels of expectations and perceptions through repeated usage of SERVQUAL. Such a comparison over time might reveal not only how the gap between the two is changing but also whether the changes are stemming from changing expectations, changing perceptions, or both.

Comparing a Company's SERVQUAL Scores against Competitors' Scores. Further Zeithaml et al. (1990) recommend additionally including a set of perception statements for some competitors. The expectations section does not have to be repeated for each company. A company can therefore easily adapt SERVQUAL and use it to track its quality of service against that of its leading competitors.

Examining Customer Segments with Differing Quality Perceptions. A further potential application of SERVQUAL is its use in categorizing a company's customer into several perceived-quality segments (e.g. high, medium, and low) on the basis of

their individual SERVQUAL scores. Zeithaml et al. (1990) indicate several possible segmentation criteria. These might be based on demographic, psychographic, or geographical factors. Overall SERVQUAL scores, as well as scores on individual dimension can be computed for each segment and compared across segments. A prerequisite for this application is the inclusion in the SERVQUAL questionnaire of questions pertaining to the relevant segmentation variables.

Assessing Quality Perceptions of Internal Customers. SERVQUAL - Zeithaml et al. (1990) suggest - can be used after appropriate adaptation, by departments and divisions within a company to ascertain the quality of service they provide to employees in other departments and divisions. The modified instrument can be administered to a sample of internal customers, e.g. from the advertisement department to its internal customer base, which might be their marketing or sales colleagues.

The original work of Parasuraman, Berry, and Zeithaml (e.g. 1988) uses the SERVQUAL instrument at a car repair company, a long-distance telephone company, a securities broker, several retail banks and credit companies. As stated in 1991 the authors replicated their 1988 study, using two additional industries: fast food and dry cleaning. Additionally, SERVQUAL has been adapted to measure service quality in a variety of settings. Several others have tried to provide a list of the different application fields of SERVQUAL.

This paper relies on Asubonteng, McCleary and Swan's (1996) summary, which names some of SERVQUAL's application areas as well as the leading researchers. SERVQUAL, they claim is used numerously in health care applications (Babakus

and Mangold, 1992, Bebko and Carg, 1995, Bowers et al., 1994, Clow et al., 1995, Headley and Miller, 1993, Licata et al., 1995, Lytle and Mokwa, 1992, O'Connor et al., 1994, Reidenbach and Sandifer-Smallwood, 1990, Woodside et al., 1998). Other settings include a dental school patient clinic, a business school placement centre, a tires store, and an emergency care hospital (Carman, 1990); independent dental offices (McAlexander et al., 1994); AIDS service agencies (Fusilier and Simpson, 1995); physicians (Brown and Swartz, 1989, Walbridge and Delene, 1993); large retail chains such as Wal-Mart, and Target (Teas, 1993); and banking, pest control, dry cleaning, and fast-food restaurants (Cronin Jr. and Taylor, 1992).

Other researchers, e.g. Fitzsimmons and Fitzsimmons (2000), state that SERVQUAL's most important function is tracking service quality trends through periodic customer surveys. They further elaborate that for multisided services, SERVQUAL could be used by management to determine if any unit underperforms quality wise. If so, management can direct attention to correcting the source of customers' poor perceptions. SERVQUAL could be used in marketing studies to compare a service with a competitor‘s and again identify the dimensions of superior or inadequate service quality (Fitzsimmons and Fitzsimmons, 2000).

Buttle (1995) completes the list of applications and researchers by naming SERVQUAL studies in hotels (Saleh and Ryan, 1992), car servicing (Bouman and van der Wiele, 1992), accounting firms (Freeman and Dart, 1993), airline catering (Babakus et al., 1993), and local government (Scott and Shieff, 1993).

2.3.2 Shortcomings and Critique

Disagreements between the studies have led to several discussions on the reliability of SERVQUAL, its set-up and assumptions and more generally about its academic as well as its business weaknesses. The major discussions relating to SERVQUAL, its most prominent critics and criticisms are summarised, listed and combined with methodological considerations in Chapter 3.9 *Methodological Dilemmas and Limitations*.

2.4 Customer Service

In an attempt to leverage the applicability of SERVQUAL to business-to-business settings Parasuraman (1998) highlights the differences in the notion of service and services. While services and service share common traits such as intangibility and perishability (eg. Parasuraman et al., 1985), they also differ in a fundamental way. Services, such as legal, janitorial and data-processing services, are intangible products that a supplier markets to its customers, Parasuraman (1998) states. Marketing intangible products (services) effectively poses unique challenges and requires a different approach than the marketing of tangible products (Shostack, 1977). Yet both tangible and intangible products are core offerings that entail traditional marketing actions like pricing and promotion.

In contrast, Parasuraman (1998) continues, service is basically a supplement that accompanies the core offering, regardless of whether the core is tangible or intangible. Hereby Parasuraman follows Lovelock's (1994) "flower of service"

concept where he depicts a seller's total offering to a customer as an eight-petaled flower whose centre represents the sellers' basic product (good or service), while its petals represent key elements of how the seller serves the customer.

This thesis conceptualises customer service as more to the petals of Lovelock's (1994) flower than to its centre. Therefore, this research emphasises the general quality of interaction between a seller and a customer, rather than the quality of the specific core offering. This is in line with Parasuraman's (1998) approach. While the focus is on service, one should also note that business-to-business marketers are increasingly augmenting their core offerings with supplementary services – e.g. consulting – to achieve competitive differentiation and advantages. To the extent that such services are free, this research considers these services as part of the domain of customer service as depicted herein.

Wouters (2004) postulates that the development of the concept of customer service is taking place through logistically oriented journals. Within marketing-oriented journals, the concept is addressed as one of the instruments for relationship building (Wetzels et al., 1995, Morris and Davis, 1992, Lancioni, 1995). More recently, researchers increasingly distinguish two basic components of customer service (Maltz and Maltz, 1998, Daugherty et al., 1994, Andraski and Novack, 1996) with one component being named "bottom line" or "reliability service". It describes the basic logistic performance regarding availability, delivery reliability, quality of deliveries etc. The second component, Wouters (2004) continues, is labelled "responsiveness" and describes an organisation's communicative skills and commercial flexibility.

Specifically, customer service is not a generic abstraction, but rather a series of specific services prior to the transaction, during the transaction and after the transaction. Based on La Londe and Zinszer's (1976) groundbreaking book *Customer Service: Meaning and Measurement* several academics have named and investigated specific attributes of customer service (Gilmour et al., 1994, Kyj and Kyj, 1994). For example, a study performed in Australia revealed more than thirty important aspects of customer service (Gilmour et al., 1994: 19):

- Delivery time
- Quality
- After-sales service
- Providing the customer with information about delivery
- Competence and availability of technical representatives
- Order accuracy
- Correct specifications
- Availability
- Supplier assistance during initial use of product
- Assistance with design changes
- Satisfactory warranty provisions
- Delivery reliability
- Credit and provision to return goods
- Friendly attitude
- Accurate documentation

- Providing the customer alternative sources if out of stock
- Providing published material
- Prompt claims procedure
- Priority given to urgent orders
- Correct installation
- Opportunity to test product prior to purchase
- Delivery reliability
- Honesty
- Help with forecasting product changes
- Wide product range
- Ability to fill the complete order
- Prompt quotation
- Priority given to advance orders
- Realistic dates provided for back orders
- Help with training operators
- Reasonable delivery estimates
- Assistance with safety considerations

Additionally, Kyj and Kyj (1994: 44) list the following additional important aspects of customer service in their 1994 article *Customer Service: Product Differentiation in International Markets:*

- Provide extended dating programmes

- Provide speed in billing
- Provide information on proper use, handling and safe storage
- Provide shipment data
- Provide in-stock inventory status
- Receive order confirmation electronically
- Free-of-charge telephone service
- Order status information
- Advance notice of order deletions
- Provision of market information
- Ability to respond to pre-order questions of potential customers
- Timely information about impending service failures
- Personal response to complaints
- Product change information

While there is general agreement that these elements might be associated with customer service, the degree of importance (if any) attached to each respective customer service varies from industry to industry and company to company, depending on customer needs and the capabilities of the service providing organisation (Kyj, 1986). In the course of this thesis the detailed discussion of customer service and its elements is being brought forward, but generically customer service is seen as consisting of the above components. Furthermore, customer service

is seen as a ‘free of charge’ supplementary service to a core offering (physical product) to achieve competitive differentiation as suggested by Parasuraman (1998).

2.5 Recapitulation

This chapter opened with a review of existing literature to lay the foundational stone for this research project in terms of a comprehensive literature assessment. At the beginning of the chapter the terms *quality* and *service quality* were introduced. These definitions are crucial to establish a clear understanding of the basic concepts of service and service quality from the outset of the research. Additionally, reference was made to different studies, which elaborate on why quality is of immense importance to the success or failure of a company. Furthermore, the *Gap Model of Service Quality* was defined and presented which will play a crucial role in the further course of this research. Relevant works from several academics such as Parasuraman, Zeithaml and Berry as well as Grönroos enriched the review of this model, enabling the researcher to assess the model from different academic perspectives. This underpinned the focus on SERVQUAL and its model and provided a common understanding of the underlying concept. Discussions and critiques concerning the five identified service gaps were stated and analysed. This evaluation will be considered for the practical part of this research project, reflecting the diverse opinions regarding this model.

The concept of SERVQUAL was first introduced including both the development of the model and the authors’ review of it. Focus was put on the five dimensions

responsiveness, assurance, tangibles, empathy and reliability, which will also be reflected in the questionnaire for the practical part of the research. The concept of the seven-point Likert scale by which respondents are asked to rate expectations and perceptions based on 22 statements was thoroughly detailed. Different applications of SERVQUAL were listed and the relevant literature was structured and presented. A detailed literature review of the areas of application was conducted to highlight the novelty of using SERVQUAL in a low involvement business-to-business setting as intended in this research. Further, this chapter detailed and clustered existing shortcomings and critique of the SERVQUAL approach and summarized several academic disputes enabling the researcher to appreciate the model from various perspectives. However, it was also outlined why the SERVQUAL model remains a powerful and valuable tool in assessing service quality. In this chapter theories of quality and satisfaction were identified and evaluated as valid and reliable. These can be tested and used in the sector of the European nylon intermediates industry.

Finally, the chapter provided a review of the existing literature on customer service. Here it was demonstrated that the academic literature offers a wide range of definitions and postulates. This was especially required to set a common literature understanding of customer service and to provide clarity of the concept's entirety. Therefore, a definition of customer service was given which will be followed for the course of the research.

The comprehensive theory review underpins the thesis and is utilised in a variety of ways. Firstly the body of theory provides a working definition of the relevant terms, especially the definition of customer service. Secondly it detailed a model to understand satisfaction through gap analysis and the related frameworks. And lastly

this chapter has derived the dimensions of service quality which are to be applied in the context of a highly tangible business-to-business context.

Having reviewed the relevant literature it is of major importance in the next step to highlight and analyse how the original authors of the SERVQUAL instrument suggest leveraging SERVQUAL's potential.

CHAPTER 3 – RESEARCH METHODOLOGY

Ranjit Kumar (2005) uses in the book *Research Methodology* the metaphor of a car journey for the research process. The first decision to take is to decide where the driver wants to go or, in other words, what research objectives the researcher wants to address. Secondly, having decided upon the research objectives, the researcher needs to define the way to find the answers. The path, Kumar (2005, 16) continues, *to finding answers to (…) the research questions constitutes the research methodology.* Just as there are posts along the way to a travel destination, there are steps, which a researcher must take during the research in order to find the answers to the research objectives. The path of this research is illustrated in Figure 7. It shows that all steps build on the actual research objectives and follow a step-by-step approach.

Kumar (2005) suggests illustrating the tasks of the research in *arrows*, which are the operational steps that need to be followed in order to conduct a study. Topics identified in *rectangles* are the required theoretical knowledge needed to carry out the individual steps. The tasks identified in *ovals* are the intermediary steps that a research needs to complete to progress from one step to another. Even though the differentiation between required intermediary knowledge and required theoretical knowledge is debatable, the classification is also used in Figure 7.

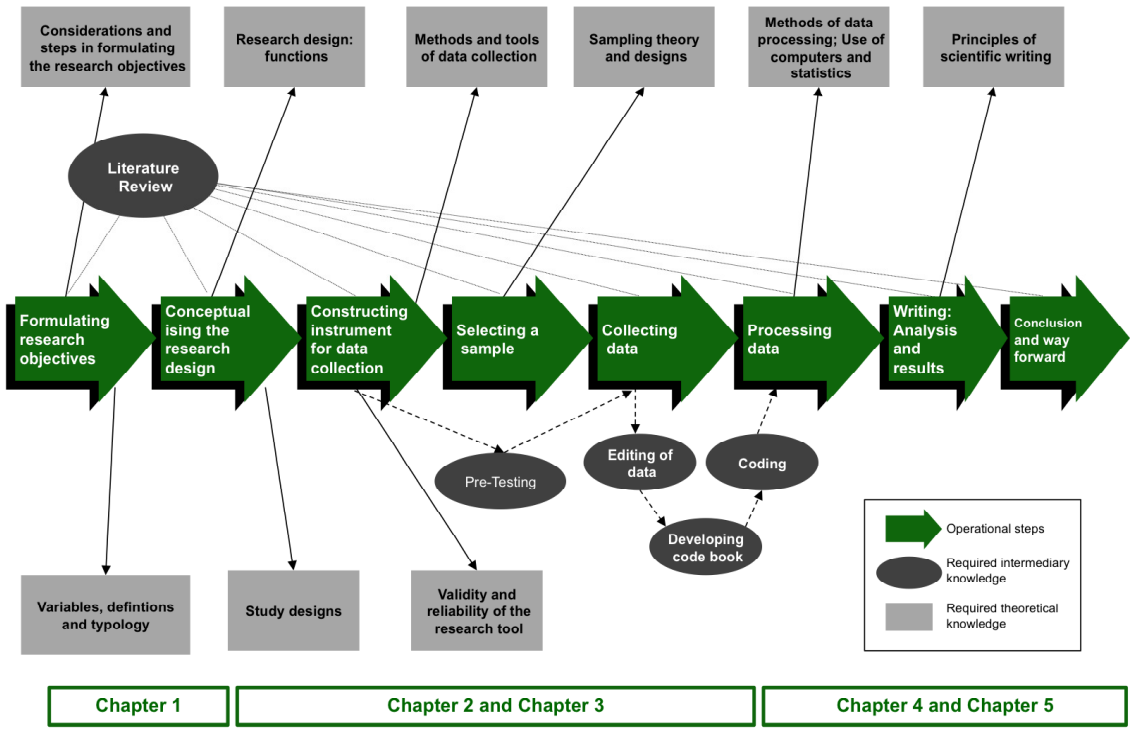


FIGURE 7: ILLUSTRATION OF THE RESEARCH PROCESS

The research process starts by describing observations made in the European nylon intermediates industry and formulating challenges and opportunities that drive this research based on the described observations (Chapter 1.1 and 1.2). During this step research objectives are developed and stated (Chapter 1.3).

The next chapter deals with the theory of measuring and managing quality and satisfaction in services. The relevant service and satisfaction theories are evaluated and the SERVQUAL concept is assessed as a valid and reliable tool that can be tested and used in the untouched sector of the European nylon intermediates industry. In this chapter the concepts of service quality, the gap model, SERVQUAL, and the customer service are discussed in detail.

This chapter, Chapter 3, details and explains the research process and is comprised of the illustrated steps research design, constructing an instrument for data collection,

and selecting a sample. Furthermore, limitations and pitfalls of this system are discussed in the course of this chapter. The in depth approach towards the research methodology is elucidated at the end of this chapter.

Chapter 4 is structured according to the research objectives and consists of the data processing as well as the results and analysis step. The chapter firstly answers the question of the applicability of an existing theory in a new market setting. Here, the usefulness and adaptability of SERVQUAL as a tool in a low involvement, highly transaction oriented business-to-business market is assessed. If accurate, Chapter 4 goes on to answer the managerial challenges along the described research objectives. For the first-time, it is being revealed how customers perceive Lanxess' customer service. These findings are then also quantified. Additionally, it is evaluated which service dimension of the customer service process is considered to be of high or low importance for the customers of Lanxess.

Lastly, Chapter 5, summaries the conclusion and recommends the next steps, both from the managerial as well as the academic perspective.

3.1 Introduction

Chapter 3 is another centre pillar for this research as it outlines the research's structure. It details and demonstrates thoroughly why this research structure is chosen. Further, it outlines how results of an exploratory research phase can be

incorporated. Finally, it is revealed how each step of the research methodology supports answering the research question.

The chapter commences by arguing why a quantitative-descriptive research method is needed to address the research question. It is reasoned why the research follows the highly structured and tested approach of the SERVQUAL survey instrument. Additionally, it is stated that the survey instrument (method) needs to include the results of the panels (results).

The next sub-chapter details the survey design and the questionnaire development while also providing a further overview of the research process. Furthermore, a flow diagram illustrating the timeframe of certain parts of the research process is included.

Next, the phase of pre-testing the SERVQUAL questionnaire is outlined. The sub-chapter opens with references to Parasuraman, Zeithaml and Berry and their postulate to use the instrument in its entirety as much as possible. Based on these recommendations of the original authors the chapter describes the extensive pre-testing phase of the research. It is also highlighted why the panel format is used to challenge the survey's design and set-up. In a first step the chapter depicts the arranged panel discussion, which analyses the usefulness of the instrument's format and its design. The chapter continues by analysing the second industry-expert panel. In this sub-chapter an analysis of each SERVQUAL statement is given. A final summary lists the outcomes of the consultations and outlines how the statements were adapted as a result of the panel discussions.

The following part elaborates on the final design of the survey instrument. It is argued that the adapted design fully supports the research objectives and facilitates answering the research question. Special attention is placed on the incorporation of results of the two panel discussions.

Moreover, the need for using the whole population of the European nylon intermediate industry as the sample size for the research process is explained. Additionally, it is manifested that the relationship between two companies is characterised as a set of "interwoven business strands" whereby these links represent a series of "exchange episodes". Therefore, the chapter claims that precise measurement of customer service in business-to-business markets requires multiple key informants representing different functional areas and organisational levels in the customer's firm.

While comparatively little has been written about the "drop and collect" survey technique the next sub-chapter demonstrates the need to follow this data-collection approach. Advantages as well as disadvantages are outlined and weighted. Special focus is placed on the response rate of different data collection techniques as well as their reliability.

The chapter continues by describing the data analysis process. Since the research process is highly linked to Parsuraman's et al. SERVQUAL concept the analysis of the derived data is done according to the suggested route of Parasuraman et al. (1988). The original thoughts about data analysis of the SERVQUAL instrument are elaborated on and an approach is suggested on how the data will be assessed in the research project. The requirements as well as the process for the analysis of

reliability and validity are demonstrated. The sub-chapter concludes with the explanation how factor analysis functions and how factor analysis is of benefit for the research process. The chapter details not only the exploratory approach to factor analysis but also the confirmatory process. Special attention is put on how model validity can be proven.

Next, the methodological dilemmas and research limitations of the suggested research approach are addressed. It is argued that these are mainly grounded in the SERVQUAL instrument itself. Several authors are quoted who have summarised and structured the discussion of several criticisms, which have been experienced in the application of the tool. This paper relies on the general structure of Buttle's 1995 work. Further the chapter acknowledges shortcomings and limitations of SERVQUAL, but argues that it has been widely applied and is highly valued not only among practitioners but also among academics as the above sections showed. Therefore, any critique of SERVQUAL must be seen within the broader context of strong endorsement.

Finally, the chapter ends by discussing and highlighting reflexivity, power and ethics issues that might arise during or after the research process. Attention is given to how confidentiality is kept and how the research-participant relationship is managed.

3.2 Methods

The essential attributes of the positivistic philosophical stance are summed up in the word *positive*, which in the English language conjures up an image of *certainty*, *precision* and *objectivity* (Brewer, 2000). The DBA thesis uses the survey method of data collection despite it being a predominantly quantitative-descriptive research. A quantitative approach is followed since the research is structured according to the methodology for collecting (survey) and analyzing data (factor analysis) and most of the data collected will be numerical data (Collis and Hussey, 2003).

This demands that data is unaffected by the interpretative and meaning-endowing process of people (Brewer, 2000) and this is guaranteed through the highly structured and tested approach of the SERVQUAL survey instrument. The slightly adapted SERVQUAL questionnaire can be characterised according to Kumar (2005) as the systematic gathering of information from respondents for the purpose of understanding some aspects of the behaviour of the population of interest. Baker (2003) postulates that such information may be factual or opinion based and the researcher's ability to secure it will depend heavily upon both the structure and the sequence in which questions are offered to the respondent. In return, the information received will be a function of the respondent's ability and willingness to answer. Since the SERVQUAL instrument has been tested multiple times (Fisk et al., 1993) it is suggested that even though short-comings exist (see Chapter 2.3.2), this research follows the descriptive research approach as suggested by Parasuraman et al. (1988).

Parasuraman et al.'s SERVQUAL instrument was chosen to measure service quality in the European nylon intermediates industry, since it is a well-established

instrument to measure service quality. This instrument has been widely used in research and its psychometric properties have been examined by numerous studies (Asubonteng et al., 1996). The original authors also assure that the instrument is applicable to a wide variety of service contexts (Parasuraman et al., 1988), although it may be necessary to reword and/or augment some of the items. This thesis' survey was conducted following distinct procedures:

- development of a survey design and questionnaire;
- pre-testing;
- selection of sample;
- data collection; and
- data analysis.

Both the questionnaire and the research procedures were developed according to the Bradford Code of Practice for Ethics in Research (see also Chapter 3.7).

3.3 Survey Design and Questionnaire Development

The research steps of conceptualising a research design, constructing an instrument for data collection, and selecting a sample - the experimental and survey design – need to be embedded in the whole research process. Each step involves several development stages. A general overview of the different stages is provided in the following illustration:

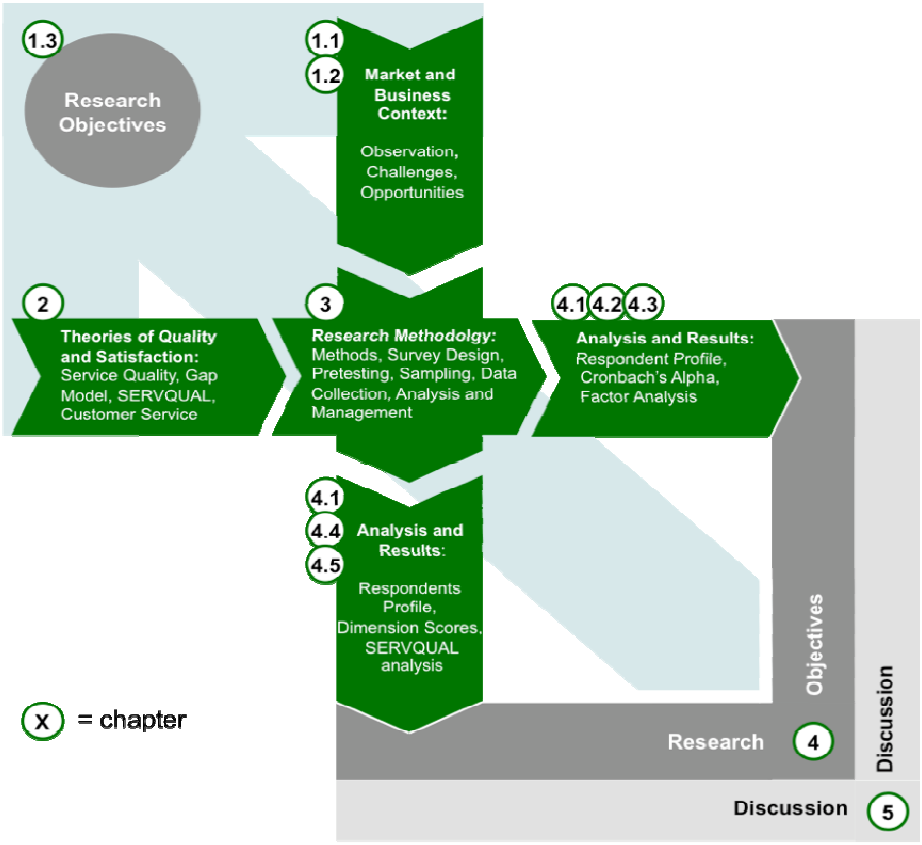


FIGURE 8: DETAILED ILLUSTRATION OF THE RESEARCH PROCESS

All research stages are guided and related to the research objectives. The survey design and questionnaire development are central piece of the research process. Not only the market and business context but also the related theories need to be sufficiently elaborated on. Additionally, the survey design and the questionnaire development need to consider the importance of analysing the data to answer the research objectives.

The illustration provides valuable information to desribe the DBA research methodology in general and the survey design phase in particular. This research fosters the link between theory and practise. Figure 8 vertically illustrates the research's contribution to practise while horizontally showing its contribution to and application of theory.

The developed questionnaire leveraged the work of Parasuraman, Zeithaml and Berry (1990, 1991) and opens with an introductory part that includes an explanation of the research's purpose and objectives. The section gives the participants the necessary background to put the survey into the right context. Part A asks participants for general information while part B, based on the SERVQUAL approach, investigates the desired, adequate and perceived service quality.

3.4 Pre-testing

Parasuraman, Zeithaml and Berry (1998) challenge different authors who have questioned SERVQUAL's universal applicability (Brown et al., 1993) by arguing that SERVQUAL provides a basic skeleton through its expectations/perceptions format encompassing statements for each of the five service-quality dimensions. When necessary, an adaptation of the skeleton is feasible to fit the characteristics or specific research needs of a particular organisation. Nevertheless, Parasuraman, Zeithaml and Berry (1991a: 445) recommend that the SERVQUAL instrument *"should be used in its entirety as much as possible. While minor modifications in the wording of items to adapt them to a specific setting are appropriate, deletion of items could affect the integrity of the scale and cast doubt on whether the reduced scale fully captures service quality"*. Further, the authors stress, any new item should be similar to an existing SERVQUAL item and be classified under the most appropriate SERVQUAL dimension to facilitate computation of the average gap score for each dimension. Finally, it is suggested to include items, which do not fit under any of the

five dimensions in the survey questionnaire to uncover the causes underlying the key problem areas or gaps identified by a SERVQUAL study.

Based on these recommendations of the original authors the research process required an extensive pre-testing of the whole survey. In a first step a panel discussion was arranged which analysed the usefulness of the format and its design. The second phase being the industry-expert panel focused on the introduction, part A and part B. Here, special attention was put on the items composition, easiness and readability, accuracy and the total length of the survey. The panel format was chosen due to a number of advantages elaborated upon hereafter. Yin (2003) lists three major advantages for a "panel of experts". Firstly, experts present their different opinions. This, secondly, provokes better discussions than a one-on-one discussion. And thirdly the frequent change of speakers keeps the attention from decreasing. Yin (2003) also names several disadvantages: personalities may overshadow content; experts are often not effective speakers; and subjects may not be discussed in logical order. All these disadvantages were considered but neglected, since the advantages of panel discussions enhanced by a detailed preparation outweigh the negative effects. Additionally, both panels could be held in Dormagen, Germany without major logistical challenges.

3.4.1 Panel with Academics

In designing the survey first advice was sought from a panel of four peer academics with expertise in data measurement and survey development. The panel members were assembled for a group discussion on layout and research-design issues pertaining to the study's general objectives.

Firstly, the panel's members alluded to the need of further testing SERVQUAL scale's validity. In order to do so the panel agreed to follow Parasuraman's et al. (1991a) recommendation to additionally assess SERVQUAL scale's validity by examining whether the measured construct is associated empirically with measures of conceptually related variables. Therefore, it was recommended to ask customers in the European nylon intermediate industry to give some company background information: how long they have been dealing with Lanxess, how frequently they are in contact with Lanxess, how often they interact with similar companies and with how many similar companies they maintain business relationships. Additionally, the experts suggested directly asking which company offers the best customer service. Both recommendations are included in Part A of the final survey.

Further, the panel discussion was primarily centred on two important issues. The first related to the debate of whether SERVQUAL or SERVPERF should be used for measuring service quality (Carrillat et al., 2007, Hudson et al., 2004, Cui et al., 2003, Kettinger and Lee, 1997). SERVQUAL, as stated above, is grounded in the gap model and measures service quality as the calculated difference between customer expectations and performance perceptions (Parasuraman et al., 1988).

Cronin and Taylor (1992) challenged this approach and developed the SERVPERF scale which directly captures customers' performance perceptions in comparison to their expectations of the service encounter. In spite of recent attempts in the literature towards solving this issue the researcher stressed to the panel that the SERVQUAL-SERVPERF debate has never been that relevant. On the one hand, numerous authors have supported the view that SERVPERF is a better model than SERVQUAL (Babakus and Boller, 1992, Brady et al., 2002, Brown et al., 1993,

Zhou, 2004) while on the other hand, SERVQUAL has gained and continues to gain widespread acceptance as a measure of service quality (Chebat et al., 1995, Furret et al., 2000, Zeithaml and Bitner, 2003). Here the researcher referred to Carrillat et al.'s (2007) article which additionally states that the web of science reveals that the original SERVQUAL paper published in 1988, as well as the following 1991 scale refinement paper have received more than 46 percent of their citations within the last five years. This indicates, in line with the panel's discussions relating to Carrillat et al. (2007), that Cronin and Taylor's (1994) conceptual arguments in favour of SERVPERF, while they may have continued to increase SERVPERF's popularity, have not reduced SERVQUAL's usage among scholars. In addition, this suggests that the multilevel scale, offered by Brady and Cronin (2001) as a reconciling perspective, has not motivated researchers to switch from SERVQUAL to SERVPERF.

Despite the various discussions and several arguments provided by researchers about the superiority of SERVPERF over SERVQUAL (Cronin Jr. and Taylor, 1992, Cronin Jr. and Tylor, 1994), the results of Carrillat et al.'s (2007) meta-analysis suggest that both scales are adequate and equally valid predictors of service quality. Therefore, the panel confirmed the suggested research path to follow the SERVQUAL approach to measuring service quality.

After agreeing on the SERVQUAL design the panel discussed several layout suggestions based on Parasuraman, Zeithaml, and Berry's (1994) work, which the researcher presented individually. The three alternative customer service quality measurement formats discussed were (Parasuraman et al., 1994, 204):

Three-Column Format. This format generates separate ratings of desired, adequate, and perceived service with three identical, side-by-side scales. It requires computing the perceived-desired and the perceived-adequate differences to quantify MSS (Measure of Service Superiority) and MSA (Measure of Service Adequacy), respectively. Thus, its operationalisation of service quality is similar to that of SERVQUAL although it does not repeat the battery of items.

Two-Column Format. In contrast to SERVQUAL, this format generates direct ratings of service-superiority and service-adequacy gaps with two identical, side-by-side scales.

One-Column Format. This format also generates direct ratings of the service-superiority and service-adequacy gaps. However, the questionnaire is split into two parts, with Part I containing one set of scales for MSS and Part II containing the same set of scales for MSA. Thus, this format involves repeating the battery of items as done in SERVQUAL.

After discussing the advantages and disadvantages of the different formats in depth, the panel perceived the three-column format as superior. The findings of the 1994 study were discussed, which demonstrate the superiority of the three-column format especially in terms of easiness to answer as well as the respondents' confidence to fill-in the questionnaire. Further, the superior diagnostic value of the three-column format was analysed. Still, the panel also identified difficulties associated with the suggested three-column format, namely administrating the whole questionnaire in its entirety may pose practical difficulties, particularly in telephone surveys. But since the drop-and-collect technique is used (see Chapter 3.5), the panel supported the use

of the three-column format. Additionally, the panel saw the benefit in following Parasuraman, Zeithaml and Berry's (1994) recommendation to substitute "adequate service" with "minimum service". Hence, the wording in the questionnaire changed from "adequate service" to "minimum service".

Intensive discussion was related to SERVQUAL's scale and its range. It was voiced that SERVQUAL applications constitute Likert scaling. As it is based on the methodology of ranking, it was suggested, that neither calculating means nor standard deviations produces any meaningful results. One panel participant alluded to hypothetical example in which 50 respondents of a sample of 100 assign "1" to a question on a 7-point Likert scaling, while the remaining 50 assign a "7". The scale is defined as "1" = unimportant, "2" = of lower importance, up to "7" = very important. For such a scale, the mean value of each item is calculated as follows μ = [(50*1) + (50*7)] / 100 = 4. Although 50% of the respondents evaluated the item as "unimportant" and 50% as "very important" the item is concluded to be "moderately important" in interpretation.

The above example has also been mentioned by Pakil and Aydin (2007) who claim that one can calculate and get a numerical ordinal scale but also state that the results will still be inadequate Such calculations are applied in the majority of SERVQUAL-related studies in both the expectation and perception sections. Most of the descriptive statistics require interval data for making true interpretations. Therefore, the authors suggest that the most significant interpretation of the results for ordinal data can be made by percentage and / or frequencies and hence each SERVQUAL item should be weighted. Nevertheless, since this approach is hardly

used and the validity and reliability is hardly challenged, the panel favoured a different approach to increase SERVQUAL's validity. Carrillat et al. (2007) reveal the need to adapt the measure to the context of the study in terms of SERVQUAL. Therefore, on the one hand the panel recommended the usage of SERVQUAL's 7-point Likert scale as well as the non-weighted items. On the other hand the panel suggested adapting the individual items to match the industrial specific context. Both suggestions were incorporated into the questionnaire.

3.4.2 Panel with Industry Experts

The *academically* adapted survey was sent to and discussed with 9 industry managers of the European nylon intermediate industry. Managers in the panel were in senior (3) and middle-management positions (6). Their functional responsibility ranged from procurement (2) to sales (3) and from marketing (2) to supply-chain management (2). The survey was reviewed, focussing on suitability, readability and ambiguity as suggested by Dillman (1999).

Firstly, the discussion focused on the language of the survey as it is generally known that language translation can be a factor impacting on cultural bias (Arksey and Knight, 1999). Even when scales are carefully translated and closely checked by experts (Wikowski and Wolfinbarger, 2002, Zhou, 2004), the absence of a concept in a language does not permit a perfect accuracy in scale translation (Herk et al., 2005). Thus, scale translation can result in higher measurement error which attenuates relationships among constructs (Hunter and Schmidt, 2004) as postulated by Carrillat et al. (2007). However, since the survey is sent out to internationally operating managers in the European nylon intermediates industry, the panel agreed that English

is the appropriate language for the survey. This assessment is supported by the fact that the correspondence between Lanxess and their nylon intermediate customers is in Italian, Spanish, English or German, while for example all contracts are written in English. Additionally, the industry experts in the panel discussed the sample and regarded only 2 companies as not-English speaking. Nevertheless, it has to be noted that most of the respondents' mother tongue is not English and hence the choice of words has to be precise and understandable aiming at avoiding any misinterpretation. Consequently, some of the original SERVQUAL battery wording had to be amended to meet this criterion.

As a result of discussing the SERVQUAL concept and the thesis' questionnaire with a panel of senior and middle-management experts from the European nylon intermediates industry, a decision was made to slightly amend the standard SERVQUAL battery to ensure suitability, readability and ambiguity as suggested by Dillman (1999) and to follow the recommended approach by the academic panel.

In the following, each question is analyzed individually by either demonstrating how the original SERVQUAL battery wording is applicable or by describing why a modification is required to meet the criteria of suitability, readability and ambiguity and to serve the overall research purpose of this thesis.

Question 1 – "Providing customer service as promised"

A concern was voiced that the original item "Providing services as promised" does not reflect the actual purpose of the questionnaire which aims at determining the role of customer service within a commodity market. Consequently, to account for the

specific setting of this thesis the general term “services” was replaced with “customer service”. This modification is crucial to reflect that the researched subject is not the actual service delivered but the customer service provided when selling nylon intermediates. Lanxess also markets services but the subject of this research is product associated service as detailed in Chapter 2.4. Hence, the wording “customer service” clearly describes, what the interviewee should base the rating on and hence, does not allow any room for uncertainties.

Question 2 – “Dependability in handling customers’ service problems”

Experts felt strongly that this item is critical for the nylon intermediates industry as time pressure is a constant given while high standards have to be maintained and hence, customers have to rely on immediate and accurate complaint handling. Consequently, this item remained unchanged.

Question 3 – “Performing customer service right the first time”

With reference to item one, experts expressed that it needs to be clearly differentiated between the company’s performance regarding the actual product delivered and the customer service attached to it.

The general applicability and importance of this item was supported, with one senior manager specifically adverting to the current pressure caused by zero fault tolerance policies which are applied by an increasing number of customers but are also implemented within the supplying companies. The need to “*get things right the first time*” was felt to be more apparent than ever.

Question 4 – "Providing customer service at the promised time"

Experts advised to apply the same logic as mentioned for items one and three, so consequently the term "services" was replaced by "customer service".

Furthermore, respondents highlighted an inevitable connection between this item and the previous one. It was even suggested that this question is already covered by item three as "*performing services right*" already includes deliveries on schedule. To some expert's understanding a satisfying customer service includes various sub items of which timeliness was regarded as essential.

Nevertheless, as this research aims at gaining a thorough understanding of the various items that build customer service, a decision was made to keep this item for the benefit of the later analysis.

Question 5 – "Maintaining error-free records"

Discussions on this item were limited. One respondent even regarded error-free records as a given or a mere "*hygiene factor*" considering the latest innovations in the area of CRM systems. Overall, it was encouraged to keep this item unmodified from the original battery.

Question 6 – "Keeping customers informed about when service will be provided"

Generally, regular communication was perceived as an essential basis for well-functioning business relationships. Proactive communication rather than reactive information sharing was regarded to be the spirit of the time, specifically mentioned by two middle-management managers.

Additionally, the difference between "*information*" and "*relevant information*" was alluded to with suggestions to address this topic in the context of this item. Respondents expressed a desire for relevant information while irrelevant information is to be avoided. In a business environment it becomes increasingly important to filter information to better serve the customer and hence, a decision has to be made which information is of relevance.

While this discussion gave thought-provoking impulses, it has to be stated that the purpose of this research is not to define relevance of information but to quantitatively research service quality. Therefore, the original SERVQUAL battery item was kept.

Question 7 – "Prompt customer service"

The wording for this item has been amended from the original reading "Prompt service to customers" which also changes the meaning of this item. In the original question, a service is delivered to a customer and it is investigated how swift this service is provided whereby the amended question explores the promptness of the customer service associated with a product purchase. Therefore, the immediate responsiveness in form of prompt customer service is of great relevance to the subsequent analysis.

When respondents were presented with this item there was common agreement on the importance of a responsive and immediate customer service. The only question raised related to the word "*prompt*" which one respondent suggested to be replaced by "*immediate*" to better capture the time element of prompt. Overall, the panel regarded this item as vital and understandable.

Question 8 – "Willingness to help customers"

Respondents regarded this question as highly important as a service contact's eagerness to serve the customer is a corner stone of responsiveness and hence the basis for customer relationship management. With the customer service team being the first point of contact it has to be guaranteed that customers are served appropriately, ensuring adequate service and avoiding complaints. It was further mentioned, that it is not only the team's willingness to help that counts but also the individual's ability to communicate this enthusiasm so that the customer feels well served. In summary, this item was considered essential and hence, was kept in its original format.

Question 9 – "Ability to respond to customer's requests"

This item caused some debate as the original word "readiness" itself was interpreted differently by the individual respondents with interpretations ranging from willingness and promptness to preparedness and ability to serve. With these definitions in mind, some interviewees raised the question of how this item differs from items 7 and 8 as a certain degree of overlap was identified. After further elaboration of which elements constitute responsiveness it was seen as essential to incorporate the overall ability to serve a customer with ability referring to qualification and capabilities. The combination of willingness, promptness and ability allows for a realistic evaluation of the overall responsiveness and consequently, "*readiness*" was replaced by "*ability*".

Question 10 – "Employees who instill confidence in customers"

It was seen essential that employees instil confidence in customers when handling requests to provide the necessary reassurance that an issue is taken care of. It was mentioned though that for simplicity reasons the wording could be changed to "Employees who provide confidence" but there was no strong consensus to do so as *instilling confidence* was generally well understood.

Question 11 – "Making customers feel safe in their transactions"

Safe and secure transaction handling was considered a foundational stone of assurance as once monetary aspects are involved customers have to be reassured of professional management. Managers across all functions were highly interested in finding out whether their company meets this requirement so this item remained unchanged.

Question 12 – "Employees who are consistently courteous"

According to the respondents, politeness is a highly regarded character trait which is vital for every member of a customer service team. Furthermore, it was seen positive that the word "consistently" features in this item as courtesy has to be a permanent element of each customer contact. No amendment of this item was suggested.

Question 13 – "Employees who have the knowledge to answer customer questions"

"*Any knowledge gap has to be identified and closed through appropriate training*" was one respondent's immediate reaction to this item. She felt that getting customer's feedback on the perceived knowledge of her employees would be

valuable information, which enables the company to further optimize their employees' continuous education. Another manager felt rather strongly, that the individual employee's knowledge is a reflection of the company's overall capabilities and hence, needs to be maintained at a high standard. It was further mentioned, that even if one employee cannot provide an answer it is important to have a back office which difficult requests can be referred to. Processes have to be in place to ensure every request can be properly handled. Respondents gave feedback that the question addresses this topic appropriately.

Question 14 – "Giving customers individual attention"

The tenor was that employees have to give each individual customer the feeling of being important and the reassurance that their request is handled properly. This item was seen as easily understandable and hence, remains unvaried from the original SERVQUAL battery.

Question 15 – "Employees who deal with customers in a caring fashion"

One manager commented that attentive and thoughtful customer handling can be a differentiating factor in a world in which depersonalization is increasing at a fast pace. The caring aspect of a one-on-one business contact seems to be of increasing importance to build long lasting business relationships. Gaining insight into how a company's employees are perceived when it comes to empathy was regarded as highly relevant. Yet some voiced concerns regarding the word "caring" which was felt to be a rather emotional term within a business setting. Suggestions for change included the words thoughtful, attentive, mindful and sympathetic. Still, for the

purpose of this thesis it was decided to stay with the original wording as empathy is an emotional topic and has to be handled as such.

Question 16 – "Having the customer's best interest at heart"

The general consensus was that employees have to convey the feeling that the customer's best interest is number one priority to ensure that an environment of trust is established. Some managers commented that while this form of trust is related to empathy and the individual point of contact, it is also crucial for a company to operate in a transparent fashion. Such a code of practice goes beyond the boundaries of this questionnaire but it was strongly felt that a customer service team can only deliver on this element of trust if the general company's business practices build on a sound foundation employees can refer to.

Question 17 – "Employees who understand the needs of their customers"

Being or having been customers themselves, all respondents rated this item as extremely important. The ability to put oneself in the position of a customer and to understand what customers require is the basis for serving them appropriately. "*Understanding customer needs"* was repeatedly described as the key competence of customer service with one manager even calling it the "holy grail" of effective customer relationship management. Being such a critical item, it is taken unchanged from the SERVQUAL battery.

Question 18 – "Convenient business hours"

While some considered convenient business hours a hygiene factor that should be a given, others discussed this question in more detail, stressing that availability is

becoming increasingly important in a rapidly changing business environment. Overall, this item was regarded essential and remains unaltered from the original.

Question 19 – "Modern Equipment (e.g. trucks, IT systems – SAP)"

In the context of this thesis, item 19 was questioned as the customer service at Lanxess is mainly operated through means of communication such as telephone, e-mail and fax or through customer visits. Consequently, the actual customer service equipment is not *visible* to the customer. It was therefore suggested to clarify this question by giving an example of what is meant by equipment with *trucks* and *IT systems (SAP, Siebel)* being mentioned as examples.

Question 20 – "Visually appealing offices"

Following the same argumentation as in item 19, it was suggested to change this item to account for the thesis' setting. While there is no customer service centre at Lanxess, personal customer service takes place in individual employee's offices. The word *office* was seen to include not only the individual offices but also the company's general premises such as the foyer. Still, by calling it offices, respondents felt that the close connection between customer service and the individual place of contact was better described then when calling it facilities. Therefore, the word *facilities* was replaced by *offices*.

Question 21 – "Sales persons who have a neat, professional appearance"

There was common agreement that employees represent their company through their own individual physical appearance. "*You get what you see*" was one manager's spontaneous reaction to this question and she consequently stressed the importance

of first impressions. Another respondent further emphasized the relevance of this item by saying that for some customers Lanxess is not the company itself but the sales representative that visits them, making the sales representative the face of Lanxess. As at Lanxess the direct customer service is the sales representative, the item was rephrased accordingly.

Question 22 – "Visually appealing materials associated with the service (e.g. Certificates of Analysis, order confirmation)"

Similarly to item 19, interviewees suggested naming an example to clarify what is meant by materials with Certificate of Analysis (COA), order confirmation and bills being mentioned as examples. Following this advice, the examples of COA and order confirmation were added to the original SERVQUAL item.

Overall, respondents supported the content and format of the questionnaire and confirmed that it meets the requirements of the European nylon intermediates industry setting.

3.4.3 Results and Adaptation

Results and feedback of the pre-testing process influenced the questionnaire's design and content. Utilizing the feedback of the pre-tests, several modifications including general wording, format, length and industry specific terms were established for parts A and B. These adaptations ensure that the questionnaire is appropriate for application within the European nylon intermediates industry. A detailed explanation of the pre-test process and finalization of the questionnaire was given above while the final questionnaire is contained in Appendix A.

Introduction and PART A

The purpose of the introduction is to give participants a clear understanding of the overall objective of the survey and to outline the reason for being included in the research. Furthermore, it is highlighted that the survey is limited to the nylon intermediates industry and that a specific interest lays on assessing the customer service level of Lanxess. Upfront, participants are informed about the time commitment required and are clearly made aware, that participation is voluntary and that all data will remain confidential. All information will be coded and will be linked to neither a company nor an individual. Due to this comprehensive introduction respondents are well informed about the research and barriers to participation are lowered.

Part A covers a series of general questions which aim at establishing the necessary background of each individual participant and their respective company. For later clustering purposes, size of company (Q1), departmental affiliation and job title (both Q2) are asked for. Furthermore, Question 3 determines how long the respondent has been dealing with Lanxess while Question 4 addresses the frequency of contact with Lanxess. The remaining questions of part A aim at gaining general insight regarding the customers' amount and frequency of interaction with other companies' customer services in similar, tangible business-to-business environments (Q5 and Q6). The last question (Q7) is an open-ended question, asking participants to state which company they are familiar with provides the best customer service. The purpose of this question is to ascertain which company's customer service the respondents perceive to be best; the mention of Lanxess at this point is feasible.

PART B

Parasuraman‘s et al. (1994) SERVQUAL instrument was adapted for the assessment of customer service quality in the European nylon intermediates industry, and is used as the key tool in this research. Since the authors recommend that managers should consider implementing a measurement approach that provides separate ratings to assess the desired, adequate, and perceived service quality (Parasuraman et al., 1994), the three-column questionnaire format is selected as the assessment tool which was also supported by the expert panel.

As stated in Chapter 3.3.1 the instrument uses a 7-point Likert scale, which is retained for this study (further information is provided in Chapter 3.3.1). This Likert scale is used three times for each statement to rate the respondent’s adequate service level (Column 1); the desired customer service level (Column 2); and the perceived service level of Lanxess’ customer service (Column 3). Each scale is anchored on both ends with “low” on the lower end of the scale (towards “1”) and “high” at the higher end of the scale (towards “7”), in accordance with the format suggested by several researchers (e.g. Babakus et al., 1993, Brensinger and Lambert, 1990, Carman, 1990, Parasuraman et al., 1991a).

Since Part B is characterised by SERVQUAL’s complexity, an illustration of three completed statements, rating the service quality within a different business-to-business setting is added to the instructions at the beginning of part B. The example stresses the requirement to tick a rating in each of the three columns and that the adequate service quality rating should be lower than or equal to the desired service

quality rating. With this demonstration, invalid responses should be reduced or at best be avoided.

Part B continues with reminding respondents that “1” is defined as “extremely poor” and “7” stands for “extremely good” to ensure that the rating scale is fully understood. Ratings between “1” and “7” describe a perception within those extremes. The SERVQUAL instrument used in this study, modified to measure the quality of customer service in a highly tangible environment is attached in Appendix A.

The following statements of the SERVQUAL scale are used to measure the five dimensions: reliability (S 1-5); responsiveness (S 6-9); assurance (S 10-13); empathy (S 14-18); and tangibles (S 19-22). Each dimension is composed of four statements, with the exception of reliability and empathy, which are evaluated using five statements. The dimensions, divided into their applicable statements, are stated in the following chapters.

Lastly, Part B contains a final question addressing the overall service quality rating of the customer service provided by Lanxess. Question 23 requests a specific Overall Service Quality (OSQ) rating using the same anchored 7-point scale as used for the SERVQUAL dimensions. The purpose of this question is to gain data to measure the instrument’s internal reliability (see also Chapter 3.6.1).

After designing the questionnaire in detail the size of the sample and the technique of data collection need to be addressed.

3.5 Sampling

The European nylon intermediate industry with a turnover of slightly over 3 billion Euro per year is characterised by a very high concentration of sellers and a high concentration of buyers. The questionnaire gathers data from those chemical players in Europe who regularly purchase nylon intermediates and thus use the customer services of nylon intermediates companies. The total population of companies in Western Europe sourcing nylon intermediates is approximately ninety. Additionally, the questionnaire requires respondents to have interacted with the customer service of Lanxess, so that the sampling frame is limited to seventy companies in Europe.

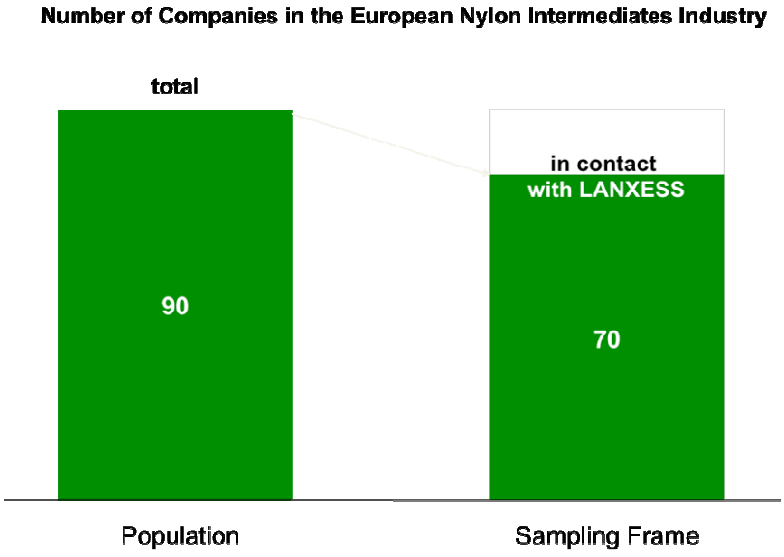


FIGURE 9: ILLUSTRATION OF SAMPLING FRAME

The question whether to use one or multiple key informants, and identifying those informants in one company, is present in designing any organizational survey, regardless of the survey's focus (Kumar, 2005). However, this challenge is particularly obvious when the survey's focus is on customer service (Parasuraman, 1998). Measuring how well one company serves another requires assessing the

quality of a potentially complex web of interactions involving multiple contacts and levels between two companies. Anderson (1995) characterizes the relationship between two companies as a set of "interwoven business strands" whereby these links represent a series of "exchange episodes" between the supplier and customer personnel. Customer service, as conceptualised in the research and as suggested by Parasuraman (1998), represents the quality of the entire fabric of interwoven business strands linking the selling and the buying firms.

Therefore, precise measurement of customer service in business-to-business markets requires multiple key informants representing different functional areas and organisational levels in the customer's firm. This approach is followed during this research by enlarging the sampling frame to all production managers, buyers and divisional heads or owners of nylon-intermediates buying companies in Europe.

3.6 Data Collection

While comparatively little has been written about the "drop and collect" survey technique the research follows this data-collection approach. Since the population is known and regularly visited by the researcher it is suggested to drop and collect the slightly adapted SERVQUAL questionnaire including further questions and a cover letter explaining the purpose of the research at a personnel level in each company. The advantages of this data collection technique are impressively demonstrated in an article in *The Marketing Intelligence and Planning* journal by Stephen Brown (1987). A significant advantage of personal collection is that it encourages both high

response rates and timely completion, with an up to 90 percent response rate at the agreed collection time. Because of this high response rate it has been estimated that in terms of cost per completed questionnaire the 'drop and collect survey' is on average 20-30 percent less expensive than postal surveys and around half the cost of face to face interviews (Brown, 1987).

Baker's (2003) third factor in favour of this technique is its reliability because of the control it gives over the sample selection process. In common with all self-completion questionnaires there is a bias towards literate respondents. There is no guarantee that the claimed respondent actually completed the questionnaire, and the personal nature of the method requires one to highly depend on clustered samples (Baker, 2003). Since some of the weaknesses are addressed in the research design it is suggested that the advantages outweigh the disadvantages and that the data collection is done through the "drop-and-collect survey" technique.

3.7 Data Analysis

Based on empirical tests with the SERVQUAL instrument and various theoretical considerations, Parasuraman et al. claim that SERVQUAL is both a reliable and valid measure of service quality (Parasuraman et al., 1988, Parasuraman et al., 1991b, Zeithaml et al., 1993). Since the research follows their recommendation the derived data will be analysed according to the suggested route of Parasuraman et al. (1988). Hereby the data is analysed leveraging the SERVQUAL concept in the

described highly tangible business-to-business setting and for the first time it is aimed at revealing how its customers in Europe perceive Lanxess' customer service.

Part of this concept is the quantifying and investigating of the customers' expectation of service quality. The data analysis allows evaluating which service dimension of the customer service process is considered to be of high or low importance for the customers. Based on this, a standardised data analysis approach for measuring customer service quality over time will be derived.

To extend the use of theory to this specific application and thus contributing to knowledge on the development of the tool and to the practice of management, the data analysis will evaluate and assess the usefulness and adaptability of SERVQUAL as a tool in a low involvement, business-to-business market environment.

3.7.1 Reliability and Validity analysis

Having described the original first thoughts about data analysis of the SERVQUAL instrument it is important to highlight them in more detail and to suggest an approach how the data will be assessed in the research. Hair et al. (2006) postulate that the researcher's goal is to reduce the measurement error and hence he must address several important characteristics of a measure.

Reliability is an assessment of the degree of consistency between multiple measurements of a variable. One commonly used form of measure of reliability is internal consistency, which applies to the consistency among the variables in a summated scale (Hair et al., 2006). This concept proven by Churchill (1979) says

that the individual items or indicators of the scale should all be measuring the same construct and thus be highly intercorrelated. The diagnostic measure is the reliability coefficient that assesses the consistency of the entire scale, with Cronbach's alpha being the most widely used measure (Cronbach, 1951, Peter, 1979). Hence, to test the reliability of the SERVQUAL instrument in the European nylon intermediate industry, the Cronbach coefficients will be computed. The results of this test produce a α-score, which is a number between 0 and 1. According to Garson, the higher the α-score is, the more reliable the measured construct. Furthermore, Nunnally and Bernstein as well as Hair et al. (2006) suggest that an α-score exceeding 0.7 indicates high internal reliability of the scale items, but there are still researchers who use different cut-off α-scores like 0.8 or even 0.6 (Garson, 2002). The thesis leverages the method and uses Cronbach's Alpha to test the reliability.

Having ensured that a scale conforms to its conceptual definition, is unidimensional and meets the necessary levels of reliability, the researcher, according to Hair et al. (2006), must make one final assessment: scale validity. The conceptual definition specifies the theoretical basis for the summated scale by defining the concept represented in terms of applicability to the research context. This is proven since the theoretical definitions of SERVQUAL are based on a priori research that defines the character and nature of a concept. Further content validity confirms the conceptual definition. This form of validity subjectively assesses the correspondence between the individual items and the concept through ratings by expert judges (panel) and pre-tests with multiple sub-populations (pilot study). Therefore, it is shown that the instrument will adequately measure how customers perceive and experience

customer service quality in the European nylon intermediate industry and it will prove the instrument content to be valid.

A further underlying assumption and essential requirement for measuring customer service quality with the help of a slightly adapted SERVQUAL instrument is that the items are unidimensional, meaning that they are strongly associated with each other and represent a single concept (McDonald, 1981). The test of unidimensionality is that each summated scale should consist of highly loading items on a single factor or if multiple dimensions are suggested - as with SERVQUAL - that each dimension should be reflected by a separate factor (Hair et al., 2006) with high loading. Here, factor analysis plays a pivotal role in making an empirical assessment of the dimensionality of a set of items by determining the number of factors and the loading of each variable on the factors (Hair et al., 2006). Since factor analysis constitutes an outstanding role in order to meet the research's objectives an additional section on how factor analysis is conducted follows.

Additionally, validity needs to be analysed. Validity according to Hair et al. (2006) is the extent to which a scale or a set of measures accurately represents the concept of interest. Parasuraman, Berry and Zeithaml (1991) state that several different forms of validity can serve as criteria for assigning the psychometric soundness of the SERVQUAL scale: face validity, convergent validity, discriminant validity, and predictive or concurrent validity. One form of validity – content validity – was already addressed in the discussion on conceptual definitions. Other forms of validity are measured empirically by the correlation between defined sets of variables (Hair et al., 2006).

Thus, the construct validity of each item will be examined to determine if the operational definition of the construct is appropriate for the European nylon intermediate industry. If all items measured are drawn from the domain of a single construct, responses to those items should be highly intercorrelated (Lai et al., 2007). Hair et al. (2006) state that high correlations indicate that the scale is measuring the intended concept. To check for construct validity the analysis for convergent validity needs to be performed. This pertains to the extent to which scale items assumed to present a construct, in fact 'converge' on the same construct, as suggested by the original authors (Parasuraman et al., 1991a). The reliability of a scale as suggested by coefficient alpha reflects the degree of cohesiveness among the scale items and is therefore an indirect indicator of convergent validity. Further, Lai et al. (2007) suggest checking the construct validity – before factor analysis – by using Cronbach coefficients if one item is removed. The statistics of 'alpha if item deleted' is the Cronbach coefficient for the rest of the scale, after the corresponding item is excluded from the construct. The 'alpha if item deleted' should – as Lai et al. (2007) claim – increase if a spurious item is deleted and though indicate which weak item can be removed from the scale. Consequently, if deletion of any item causes the Cronbach coefficient to decrease, all items should stay. In order to investigate discriminant and predictive or concurrent validity the concept of factor analysis and thus the suggested concept of data management is described.

3.7.2 Factor Analysis

Parasuraman, Zeithaml and Berry (1988) observe a clear five-dimensional factor in the original SERVQUAL study. This result derived from a comprehensive factor

analysis of the 1988 data. However, the number of dimensions and stability of items across different industries has been questioned by a number of authors. Caruana et al. (2000) name several examples: Carman (1990) finds nine factors in hospital services and also provided evidence of items not loading on factors as expected; Gagliano and Hathcote (1994) state four factors in retail clothing sector; others identified three in car servicing (Bouman and van der Wiele, 1992). Cronin and Taylor (1992) who examined four types of companies, namely, banks, dry cleaning, pest control and fast food, make use of confirmatory factor analysis to compare the SERVQUAL five factor intercorrelated model with a single factor structure. They conclude that the five-dimension structure is not confirmed in any of the research samples and that a unidimensional structure better fits the data. Babakus and Boller (1992) suggest that the number of service quality dimensions is dependent on the service offered. Robinson (1999) even summarises that *despite Parasuraman et al.'s (1988) initial claim that their five dimensions are generic, it is generally agreed that this is not the case, and that the number and definitions varies depending on the context.*

Nevertheless, Parasuraman, Zeithaml and Berry (1988) observe a clear five-dimensional factor in the original SERVQUAL study. This result derived from a comprehensive factor analysis of the 1988 data. Factor analysis is an interdependence technique, whose primary purpose is to define the underlying structure among the variables in the analysis. Hair et al. (2006) state that factor analysis provides the tools for analysing the structure of the interrelationships (correlations) among a large number of variables (e.g. the 22-items) by defining sets of variables that are highly intercorrelated, known as factors. These groups (factors) of variables that are by definition highly intercorrelated are assumed to represent

dimensions (here: the RATER-dimensions) within the data. Several authors have validated the SERVQUAL factors with the help of factor analysis (e.g. Babakus and Boller, 1992); this approach to data reduction validates the items that have be chosen to measure each of the theorized factors based on the SERVQUAL model.

Since one of the objectives of this study is to assess and apply the SERVQUAL instrument in the new context of the European nylon intermediates industry the dimensionality and hence the validity of the SERVQUAL instrument is assessed with the help of factor analysis. There are two main approaches to factor analysis that are described in the literature – exploratory and confirmatory. Exploratory factor analysis is often used in research to gather information about (explore) the inter-relationships among a set of variables (Pallant, 2001). Confirmatory factor analysis on the other hand, is a more complex and sophisticated set of techniques used in research processes to test (confirm) specific hypotheses or theories concerning the structure underlying a set of variables (Pallant, 2001).

There are a number of different methods for performing an ***exploratory factor analysis***. This thesis will elaborate on the most popular analysis, which is the principle components analysis. This method analyses the total variance and attempts to explain the maximum amount of variance by the minimum number of underlying factors (Hinton et al., 2004). Before conducting a factor analysis **step one** requires the assessment of the suitability of the data for factor analysis. There are two main issues to consider when determining whether a particular data set is suitable for factor analysis: sample size and the strength of the relationship among the items (Pallant, 2001). While there is little agreement among authors concerning how large a sample should be, the general recommendation is “the larger the better”. Pallant

(2001) states that in small samples the correlation coefficients among the variables are less reliable with a tendency to vary from sample to sample. Factors obtained for small data sets do not generalise as well as those derived from larger samples. Tabachnik and Fidell (2001) review this issue and suggest that a smaller sample size is adequate if there are strong, reliable correlations and a few distinct factors. Stevens (2001) suggests that the sample size requirements advocated by researchers have been decreasing over the years as more research has been done on the topic. He makes a number of recommendations concerning the reliability of factor structures and the sample size requirements. Some authors suggest that it is not the overall sample sizes that is of concern, but the ratio of subjects to item. Authors suggest that 5 cases for each item is adequate in most instances (Tabachnick and Fidell, 2001). Hair et al. (2010: 102) summarise by stating *regarding the sample size question, the researcher generally would not factor analyse a sample of fewer than 50 observations, and preferably the sample size should be 100 or larger. As a general rule, the minimum is to have at least five times as many observations as the number of variables to be analyzed.*

The second issue to be addressed relates to the strength of the inter-correlations among the items. Hair et al. (2010) postulate that the researcher must ensure that the data matrix has sufficient correlations to justify the application of factor analysis. Several tests for the adequacy of applying factor analysis are at hand. Tabachnick and Fidell (2001) recommend an inspection of the correlation matrix for evidence of coefficients greater than 0.3. If few correlations above this level are found, than factor analysis may not be appropriate. Another method of determining the appropriateness of factor analysis examines the entire correlation matrix. The Bartlett

test of sphericity, a statistical test for the presence of correlations among the variables, is such a measure. Hair et al. (2010) explain that the test provides statistical significance if the correlation matrix has significant correlations among at least some of the variables. Pallant (2001) states that the Bartlett's test of sphericity should be significant ($p<0.05$) for the factor analysis to be considered appropriate. A further measure to quantify the degree of inter-correlations among the variables and the appropriateness of factor analysis is the measure of sampling adequacy (Hair et al., 2010). Several authors refer to the test as the Kaiser-Meyer-Olkin test (e.g. Hinton et al., 2004). This index ranges form 0 to 1, reaching 1 when each variable is perfectly predicted without error by the other variables. Kaiser (1974) recommends to read the measure with the following guidelines: .80 or above, meritorious; .70 of above, middling; .60 or above, mediocre; .50 or above, miserable; and below .50 unacceptable. The researcher, Hair et al. (2010) recommend, should always have an overall measure of sampling adequacy of above .50 before proceeding with the factor analysis.

Once the variables are specified and the correlation matrix is prepared, the researcher is ready to apply factor analysis to identify the underlying structure of relationships in **step two** (Hair et al., 2010). In doing so, factor extraction involves determining the smallest number of factors that can be used to best represent the inter-relations among the set of variables. There are a variety of approaches that can be used to identify (extract) the number of underlying factors or dimensions (Pallant, 2001). Pallant (2001) lists some of the most commonly available extraction techniques:

- Principal components;
- Principal factors;

- Image factoring;
- Maximum likelihood factoring;
- Alpha factoring;
- Unweighted least squares; and
- Generalised least squares.

The most commonly used approach as noted earlier is principal components analysis (Pallant, 2001). Hair et al. (2010) illustrate that when a decision has been made on the factor model, the researcher is ready to extract the initial unrotated factors. By examining the unrotated factor matrix, the researcher can explore the potential for data reduction and obtain a preliminary estimate of the number of factors to extract (Hair et al., 2010). It is the researcher's choice to determine the number of factors that are considered to best describe the underlying relationship among the variables. This involves balancing two conflicting needs, as stated by Pallant (2001): the need to find a simple solution with as few factors as possible; and the need to explain as much of the variance in the original data set as possible. Tabachnick and Fidell (2001) recommend that researchers that adopt an exploratory approach should experiment with different numbers of factors until a satisfactory solution is achieved.

There are several techniques that can be used to assist the decision concerning the number of factors to retain. The most commonly used technique is the latent root criterion (Hair et al., 2010) or referred to by other researchers as the Kaiser's criterion (e.g. Coolican, 1992). The rationale for Kaiser's criterion is that any individual factor should account for the variance of at least a single variable if it is to be retained for interpretation (Hair et al., 2010). Applying this rule, only factors with

an eigenvalue of 1.0 or more are retained for further investigation. The eigenvalue of a factor represents the amount of the total variance explained by that factor (Pallant, 2001). Using the eigenvalue for establishing a cut-off is most reliable when the number of variables is between 20 and 50, Hair et al. (2010) conclude. Kaiser's criterion has been criticised as it results in the retention of too many factors in some situations.

Another approach that can be used is Catell's scree test (Catell, 1966). The scree test is derived by plotting the eigenvalues against the number of factors in their order of extraction, and the shape of the resulting curve is used to evaluate the cut-off point (Hair et al., 2010). Catell (1966) recommends retaining all factors above the elbow, or break in the plot, as these factors contribute most to the explanation of the variance in the data set. A further criterion to determine the number of factors is the so-called a priori criterion. The a priori criterion is a simple yet reasonable criterion under certain circumstances. When applying it, Hair et al. (2010) state, the researcher already knows how many factors to extract before undertaking the factor analysis. This approach is useful when testing a theory or hypothesis about the number of factors to be extracted. Hair et al. (2010) continue that it can also be a justified approach when attempting to replicate another researcher's work and extract the same number of factors that was previously found (confirmatory). Other criteria such as the percentage of variance also exist. Here the percentage of variance criterion is an approach based on achieving a specified cumulative percentage of total variance extracted by successive factors. The purpose is to assure practical significance for the derived factors by ensuring that they explain at least a specified amount of variance.

However, Hair et al. (2010) conclude: in practise, most researchers seldom use a single criterion in deciding how many factors to extract. Instead, they initially refer to a criterion such as the eigenvalue as guideline for the first attempt at interpretation. After the factors are interpreted the practicality of the factors is assessed. Factors identified by other criteria are also interpreted. Finally, several factor solutions with differing numbers of factors are examined before the final structure is well defined.

Once the number of factors has been determined, the **third and last step** is their interpretation. To assist this process the factors are 'rotated' - Hair et al. (2010) describe this as the fundamental process of interpreting the factors. Rotation, Pallant (2001) states, does not change the underlying solution, but presents the pattern of loadings in a manner that is easier to interpret. Or as Hair et al. (2010, 113) postulate

> *the term rotation means exactly what it implies. Specifically, the reference axes of the factors are turned about the origin until some other position has been reached. […], unrotated factor solutions extract factors in the order of their variance extracted. The first factor tends to be a general factor with almost every variable loading significantly, and it accounts for the largest amount of variance. The second and subsequent factors are then based on the residual amount of variance. Each accounts for successively smaller portions of variance. The ultimate effect of rotating the factor matrix is to redistribute the variance from earlier factors to later ones to achieve a simpler, theoretically more meaningful pattern.*

There are two main approaches to rotation, resulting in either orthogonal (uncorrelated) or oblique (correlated) factor solutions. Tabachnick and Fidell (1996) postulate that orthogonal rotation results in solutions which are easier to interpret and to report, however they require the researcher to assume that the underlying constructs are independent (not correlated). Oblique approaches allow for the factors to be correlated, but are more difficult to interpret, describe and report (Tabachnick and Fidell, 1996). In practice, Pallant (2001) adds, the two approaches (orthogonal

and oblique) often result in very similar solutions, particularly when the pattern of correlations among the items is clear. Within the two broad categories of rotational approaches there are a number of different rotational techniques. SPSS for example features for the orthogonal rotation Varimax, Quartimax and Equamax techniques and for the oblique rotation Direct Oblimin and Promax. The most commonly used orthogonal approach is the Varimax method, which attempts to minimise the number of variables that have high loadings on each factor (Pallant, 2001). The most commonly used oblique technique is Direct Oblimin. However, in practice, the objective of all methods of rotation is to simplify the rows and columns of the factor matrix to facilitate interpretation, Hair et al. (2010) conclude. They continue by stating that no specific rules have been developed to guide the researcher in selecting a particular orthogonal or oblique rotational technique. The choice of a rotation should be made on the basis of the particular needs of a given research problem.

A ***confirmatory factor analysis***, Bollen (1989) states in his book *Structural Equations with Latent Variables*, statistically tests whether the sample data confirms the theoretical model. Hair et al. (2010, 631) advocate that confirmatory analysis is *the use of a multivariate technique to test (confirm) a prespecified relationship*. This approach towards validating data is of upmost importance for this research, since the five-dimensionality of the original SERVQUAL construct can be tested based on the data set gained from the European nylon intermediates industry. In Parasuraman et al.'s (1988) revised service quality model it is suggested that the service quality construct can be measured using its five dimensions as reflective indicators. This framework suggests a single-factor measurement model with five observable variables. Each observable variable is a composite score obtained from the subscales.

This approach, the authors claim, enables the five dimensions of the service quality expectations and perceptions to remain intact. Although the initial results of an exploratory factor analysis might not identify the proposed five dimensions, this could be due to the highly correlated nature of the five dimensions of service quality. The confirmatory factor analysis should be based on the a priori suggested dimensions of Parasuraman, Berry and Zeithaml (1988). Such practices are common in the literature to reduce model complexities, Babakus and Mangold (1992) recommend by referring to Bagozzi (1980), Joachimsthaler and Lastovicka (1984), and Jöreskog (1978).

In developing and conducting a confirmatory factor analysis several authors give descriptions of the required steps to structural equation modelling (SEM). Bollen and Long (1993) suggest a five step approach comprised of: model specification, identification, estimation, testing fit, and respecification. Hair, Black, Babin, and Anderson (2010) however suggest a four plus two stages process consisting of

- Defining individual constructs
- Developing the overall measurement model
- Designing a study to produce empirical results
- Assessing the measurement model validity
- Specifying the structural model
- Assessing structural model validity

The first stage needs to answer the question what items are to be used as measured variables. Thus the process begins by listing the constructs that build the measurement model. If one has experience with measuring the construct, then a scale that was previously used can possibly be applied again (Hair et al., 2010). Since SERVQUAL is a well-established construct the process of designing a new construct measure is obsolete. Therefore, stage 2 of the process starts by developing and specifying the measurement model. At this stage a path diagram for the measurement model needs to be drawn. In this stage, Hair et al. (2010, 656) describe that *each latent construct to be included in the model is identified and the measured indicator variables (items) are assigned to latent constructs. Although this identification and assignment can be represented by equations, it is simpler to represent this process with a diagram.*

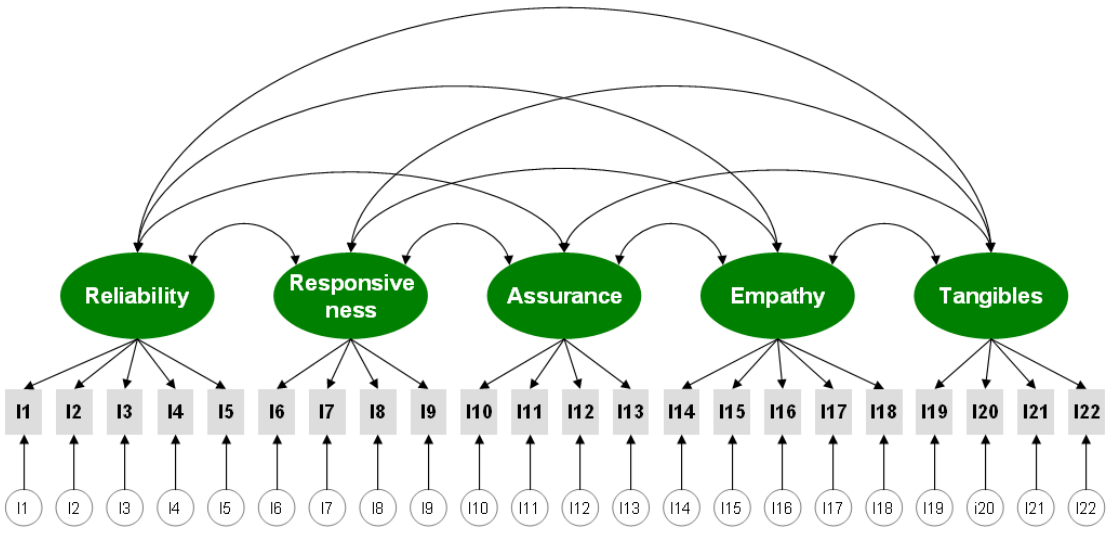


FIGURE 10: ILLUSTRATION OF THE SERVQUAL STRUCTURAL MODEL

The basic SERVQUAL measurement model is illustrated as shown in Figure 10. It has to be noted that no modifications that might be required have been done in the

illustration and that loading estimates and the between-construct correlation estimate variables are not displayed.

With the basic model specified in terms of constructs and measured variables, stage three of the confirmatory factor analysis process must, according to Hair et. al (2010), draw attention to issues related to the research design and estimation. Here, the focus lies on the impact and handling of missing data and the various estimation techniques available. Hair et. al (2010) recall that missing data must always be addressed and that they have a big impact on SEM. There are three basic methods available for solving the missing data problem: the complete case approach (listwise deletion); the all-available approach (pairwise deletion); and imputation techniques (e.g., mean substitution). Traditionally, Hair et. al (2010) advise, listwise deletion has been considered most appropriate for SEM. More recently, pairwise deletion, which allows the use of more data, has been applied. This research follows the model-based approach – which is the fourth basic model – since the advantages become particularly apparent once sample size and factor loadings become generally smaller (Hair et al., 2010). Enders and Peugh (2004) name in their article *Missing Data in Educational Research: A Review of Reporting Practices and Suggestions for Improvement* as the main advantages fewer problems with convergence, Chi-square shows little bias under most conditions; and finally least bias under conditions of random missing data.

Another decision that stage four requires is selecting an adequate estimation method. Although there are many varieties of estimation methods, the three most commonly used estimation procedures shall be highlighted here: maximum likelihood (ML), generalized least squares (GLS) derived under Norman distribution assumptions, and

the asymptotic distribution free (ADF) method. Maximum likelihood estimation has been the most commonly used approach in structural equation modelling (Chou and Bentler, 1995). Extensive research has focused on the robustness of ML and other estimation methods (e.g. Kline, 1998, Kaplan, 2009, Anderson and Gerbing, 1984). ML estimates have been found to be quite robust to the violation of normality. The GLS method, in contrast, has been found likely to be negatively biased (e.g. Browne, 1974, Jöreskog and Goldberger, 1972). The results reported for the ADF approach have not been consistent. The ADF estimates were observed to be biased by Browne (1984), Chou et al. (1991), but not by Muthén and Kaplan (1992). This research follows the recommendation of Hair et. al (2010, 663) and applies the technique of maximum likelihood estimation, since *it has proven fairly robust to violations of normality assumption* and has *produced reliable results under many circumstances*.

With the measurement model specified and the key decisions such as the estimation technique made, the next stage is the most fundamental one in structural equation modelling. At this stage the question if the measurement model is valid needs to be answered. Hair et. al (2010) express that the measurement model validity depends on (1) establishing acceptable levels of goodness-of-fit for the measurement model and (2) finding specific evidence of construct validity. Figure 11 illustrates some of the available measurements and approaches of how to assess the validity of the measurement model.

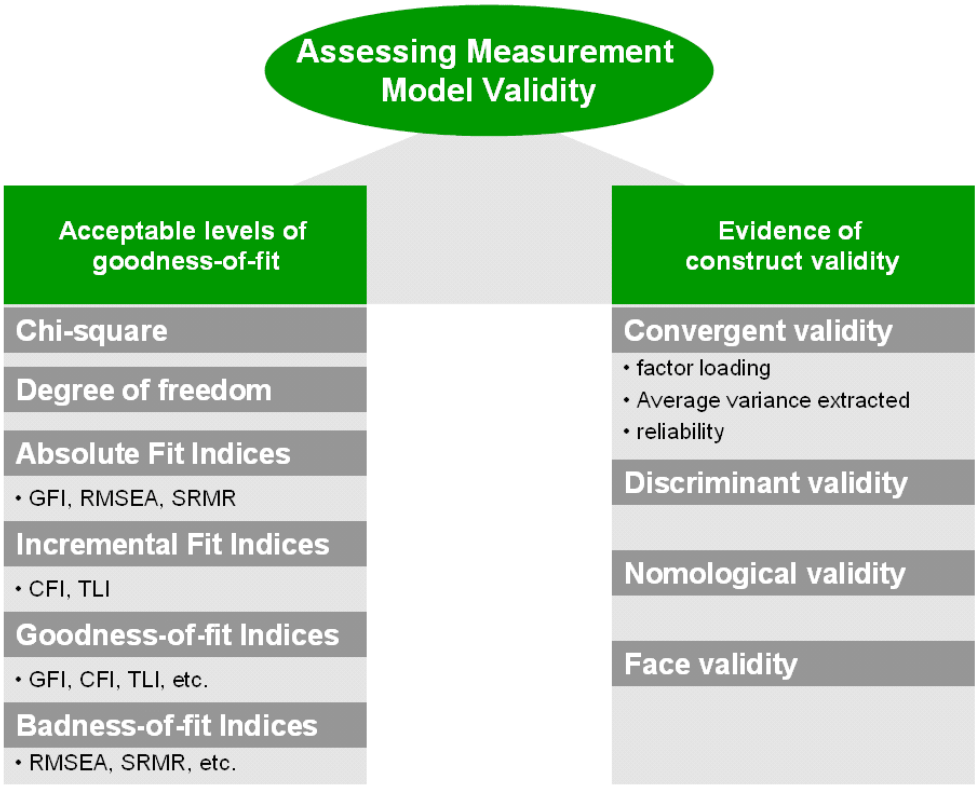


FIGURE 11: ASSESSING MEASUREMENT MODEL VALIDITY

Despite the availability of various measures of model fit, researchers often have difficulty determining the adequacy of a structural equation model because different aspects of the results direct to conflicting conclusions about the extent to which the model actually matches the observed data (Hu and Bentler, 1995). As structural equation modelling is used in this research to assess the validity of SERVQUAL in the European nylon intermediates industry, only the main ways of evaluating model fit are presented and evaluated. In general Hair et. al (2010) state that Goodness-of-fit (GOF) indicates how well the specified model reproduces the observed covariance matrix among the indicators. Once a specified model is estimated, model fit compares the theory to reality by assessing the similarity of the estimated covariance matrix (SERVQUAL) to reality (collected data). If for example the SERVQUAL theory was perfect, the observed and estimated covariance matrices would be equal. The values of any GOF measures, Hair et al. (2010) explain, result from a

mathematical comparison of these two matrices and the closer the values of theses two matrices are to each other, the better the model is said to fit. The two most popular ways of evaluating model fit are those that involve the chi-square goodness-of-fit statistic and the so-called fit indexes that have been offered to supplement the chi-square test (Hu and Bentler, 1995).

Hair et al. (2010) claim that one should start structural equation modelling by examining chi-square because it is the fundamental measure of differences between the observed and estimated covariance matrices. The chi-square test enjoyed substantial popularity at first, because it seemed as if its use could free confirmatory factor analysis from many subjective decisions that were historically associated with exploratory factor analysis (Jöreskog, 1969). However, problems associated with goodness-of-fit chi-square test were early recognised (e.g. Bentler and Bonett, 1980) and have provoked ongoing discussions (e.g. Kaplan, 1990).

The chi-square GOF statistic has two mathematical properties that are problematic in its use as a GOF measure. Hair et al. (2010) elaborate on the chi-square statistic being a mathematical function of the sample size and the difference between the observed and estimated covariance matrices. A sample size increase is accompanied by an increase in the chi-square value and even the differences between matrices are identical. Second the chi-square statistic is also likely to be greater when the number of observed variables raises thus adding indicators to a model causes the chi-square values to increase and makes it more difficult to achieve model fit. For this reason, the chi-square GOF test is often not used as the sole GOF measure and additionally, many alternative measures of fit exist. This research applies some of these measures;

therefore these GOF indices - based on Hair et al.'s work (2010, 667-8) – are briefly introduced as follows.

Goodness-of-Fit Index (GFI) The GFI was an early attempt to produce a fit statistic that was less sensitive to sample size. […] The possible range of GFI values is 0 to 1, with higher values indicating better fit. In the past, GFI values of greater than .90 typically were considered good. […] Recent development of other fit indices has led to a decline in usage.

Root Mean Square Error of Approximation (RMSEA) One of the most widely used measures that attempts to correct for the tendency of the chi-square GOF test statistic to reject models with a large sample or a large number of observed variables is the root mean square error of approximation. […] The question of what is a "good" RMSEA value is debatable. Although previous research had sometimes pointed to a cut-off value of .05 or .08, more recent research points to the fact that drawing an absolute cut-off for RMSEA is inadvisable.

Normed Chi-square This GOF measure is a simple ratio of chi-square to the degrees of freedom[3] for a model. Generally, chi-square ratios on the order 3:1 or less are associated with better-fitting models. […]

Incremental fit indices differ from the above absolute fit indices in that they assess how well the estimated model fits relative to alternative models. This category of fit indices represents the improvement in fit by specification of related multi-item constructs. The following list based on Hair et al.'s research (2010, 668-9) describes some of the most widely used incremental fit measures.

Normed Fit Index (NFI) The normed fit index is one of the original incremental fit indices. It is a ratio of the difference of the chi-square value for the fitted model and a null model divided by the chi-square for the null model divided by the chi-square value for the null model. It ranges between 0 and 1, and a model with perfect fit would produce an NFI of 1.

[3] Hair et al. (2010) postulate degrees of freedom represent the amount of mathematical information available to estimate model parameters. The degrees of freedom of the model therefore represent the number of dimensions in which the data are free to differ from the reproduced model and thus are a measure of the disconfirmability of the model (Mulaik, 1993). The degrees of freedom in structural equation modeling are based on the size of the covariance matrix, which comes from the number of indicators in the model.

Tucker-Lewis Index (TLI) The Tucker-Lewis index (TLI) is conceptually similar to the NFI, but it varies in that it is actually a comparison of the normed chi-square values for the null and specified model, which to some degree takes into account model complexity. However, the TLI is not normed, and thus its values can fall below 0 or above 1. Typically though, models with good fit have values that approach 1, and a model with higher value suggest a better fit than a model with a lower value.

Comparative Fit Index (CFI) The comparative fit index is an incremental fit index that is an improved version of the normed fit index. The CFI is normed so that values range between 0 and 1, with higher values indicating better fit. […] CFI values above .90 are usually associated with a model that fits well.

The group of parsimony fit indices is specially designed to provide information about which model among a set of competing models is best, considering its fit relative to its complexity. The use of parsimony fit indices remains controversial according to Hair et al. (2010). The research makes use of only one of the indexes, which Hair et al. (2010, 669) describe as follows.

Adjusted Goodness of Fit Index (AGFI) An adjusted goodness-of-fit index tries to take into account differing degrees of model complexity. It does so by adjusting GFI by a ratio of the degrees of freedom used in a model to the total degrees of freedom available. […] AGFI values are typically lower than GFU values in proportion to model complexity. […] As with the GFI, however, the AGFI is less frequently used in favour of the other indices that are not as affected by sample size and model complexity.

If based on the above measurements the tested model produces acceptable fit measures the evidences of construct validity also need to be analysed (see Figure 11). Following the seminal work of Campbell and Fiske (1959), construct validity research typically focuses on the extent to which data exhibit evidence of: convergent validity, the extent to which indicators of a specific construct converge or share a high portion of variance in common and discriminant validity and the extent to which a construct is truly distinct from other constructs. Hair et al. (2010)

supplement these tests of validity with tests of nomological and face validity to assess construct validity. Next the above tests are briefly introduced.

Several ways are available to estimate the relative amount of convergent validity among item measures. One important consideration is the size of the *factor loadings*. A high convergent validity combined with high loadings on a factor would indicate that they converge on a common point, the latent construct. At a minimum Janssens et al. (2008) state the variable measures must all have high loading (> .50) on the latent variables and have to be significant (Critical Ratio = t-value > 1.96). Another way to analyse the convergent validity is to calculate the *average variance extracted (*AVE) which represents the mean variance extracted for the items loading on a construct and is a summary indicator of convergence (Fornell and Yi, 1992). Hair et al. (2010) describe an AVE of less than 0.50 to indicate that, on average, more errors remain in the items than variance explained by the latent factor structure imposed on the measure. The AVE measure should be computed for each latent construct in a measurement model. Reliability is also a hint of convergent validity. As discussed above coefficient alpha remains a commonly applied estimate and has been discussed in more detail at the beginning of this chapter.

Discriminant validity is achieved when the correlation between constructs differs significantly from 1 or when the Chi-square difference test indicates that two constructs are not perfectly correlated (Janssens et al., 2008). AMOS, the support tool used (see below), presents the correlations between the constructs, but it does not give the corresponding confidence intervals with the maximum likelihood estimation technique. Therefore, another procedure to check for discriminant validity is applied. This measurement was developed by Fornell and Larcker (1981). They

advance that for each couple of constructs the square of the correlation between these two constructs should be smaller than their corresponding AVE.

Constructs should also have face and nomological validity. The processes for testing these properties are the same as for exploratory factor analysis. Face validity must be established prior to any theoretical testing when using factor analysis (see above). Nomological validity is then tested by examining whether the correlations among the constructs in a measurement theory are plausible (Hair et al. 2010).

The six structural equation modelling stages now continue. Stage 1 to 4 covered the confirmatory factor analysis process from identifying model constructs to assessing the measurement model validity (see above). If the measurement is deemed sufficiently valid, according to Hair et al. (2010), the researcher can test a structural model composed of these measures, bringing the approach to stages 5 and 6 of the SEM process. Stage 5 entails specifying the structural model while stage 6 involves naming factors. The stages 5 and 6 do not have to be analysed and explained in detail, since one of the objectives of this research is to analyse and evaluate - with the help of the confirmatory factor analysis - if the SERVQUAL construct introduced by Parasuraman, Berry, and Zeithaml provides a valid and reliable tool for analysing customer service in the European nylon intermediates industry.

3.8 Data Management and Analysis Procedures

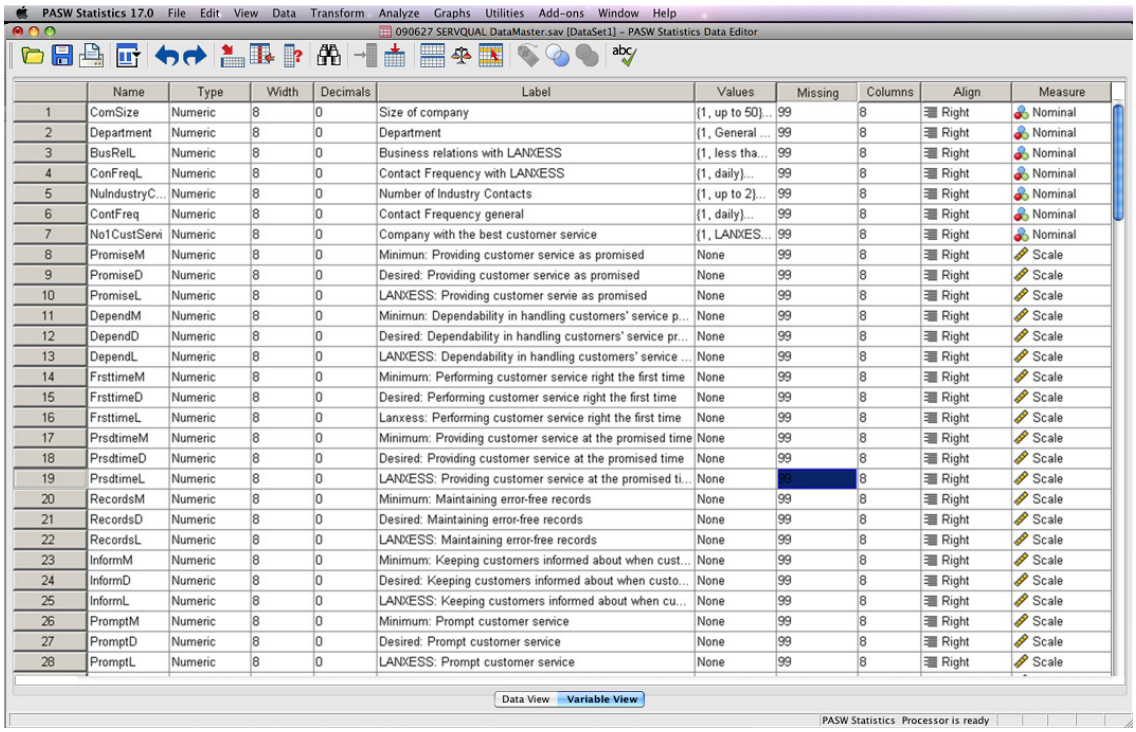
Before starting to analyse the retrieved data it is of importance to demonstrate how data management is conducted and how the analysis is pursued operationally. In order to follow a structured approach towards data management the research uses PASW Statistics 17.0 for Mac. Before receiving the completed questionnaires the variable view in - formerly called - SPSS was set up. Here special attention was put on the adequate translation of the questionnaire into the variable and later to the data view.

The questionnaire started with Part A and asked *Please indicate your company's size in terms of employees*. This first question was named *ComSize* and labelled *Size of Company* in the Variable View of PASW Statistics. The values were defined as 1 = "up to 50", 2 = "51-200", 3 = "201-500", 4 = "above 500". The second question *Please indicate the department you are working for* was named and labelled *Department*. The option boxes in the questionnaire were coded to 1 = "General Management", 2 = "Procurement", 3 = "Production", 4 = "Marketing", and finally 5 = "Sales". The following question asked the respondent to indicate the duration of business relations with Lanxess. This question was named *BusRelL* and labelled *Business relations with Lanxess*. The possible answers were transformed to 1 = "less than a year", 2 = "1-5 years", and 3 = "more than 5 years". Question 4 related to the frequency of contacts between the customer and Lanxess and thus was consequently labelled *ConFreqL*. The answer options were coded as 1 = "daily", 2 = "weekly", 3 = "monthly", and 4 = "quarterly". Accordingly, question 5 in Part A was named *NuIndustryCon* and was labelled *Number of Industry Contacts.* The translation for this question was defined as 1 = "up to 2", 2 = "3-5", 3 = "6-10", and finally 4 =

"above 10". The next question related to the frequency of contact to those customers. Hence, this variable was named *ContFreq* and labelled *Contact Frequency general*. The coding was in accordance with the previous question of this type and consequently defined as 1 = "daily", 2 = "weekly", 3 = "monthly", and 4 = "quarterly". The last question of Part A asked: *Please name the company which in your opinion offers the best customer service.* This variable was named *No1CustoServi* and labelled *Company with the best customer service.* Since no answer option was given in the questionnaire the coding proofed to be of higher importance. The coding was defined as 1 = "Lanxess", 2 = "BASF", 3 = "DSM", 4 = "Rhodia", 5 = "Domo", 6 = "UBE", 7 = "Radici", and 8 = "Others". All of the described variables in Part A are nominal measures (Janssens et al., 2008).

Before explaining the data coding and management for Part B, the handling of missing values has to be addressed. Pete Greasley (2008) states that although sometimes data is missing, PASW classifies any blank cell as missing data and excludes it from any calculations. Hence, if cells are left unfilled there is no need to enter values for missing data. In this case, the researcher would not fill in a value in the *Data View* screen from PASW and this would remain an empty cell. Nevertheless, this research follows the recommendation of Janssens et al. (2008) that if the user must work with a large amount of data or is unable to fill in the data in one session, a clear indication of missing values should be provided whether this involves a value that has not yet been filled in or whether it is a real observation for which no answer was obtained. In this last case, the researcher, Janssens et al. (2008) recommend, can indicate this by using the value of *99* for example, or another value

that does not occur among the possible answers. This recommendation is exactly followed for this research and missing values are uniformly referred to as *99*.



	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure
1	ComSize	Numeric	8	0	Size of company	{1, up to 50}...	99	8	Right	Nominal
2	Department	Numeric	8	0	Department	{1, General ...	99	8	Right	Nominal
3	BusRelL	Numeric	8	0	Business relations with LANXESS	{1, less tha...	99	8	Right	Nominal
4	ConFreqL	Numeric	8	0	Contact Frequency with LANXESS	{1, daily}...	99	8	Right	Nominal
5	NuIndustryC...	Numeric	8	0	Number of Industry Contacts	{1, up to 2}...	99	8	Right	Nominal
6	ContFreq	Numeric	8	0	Contact Frequency general	{1, daily}...	99	8	Right	Nominal
7	No1CustServi	Numeric	8	0	Company with the best customer service	{1, LANXES...	99	8	Right	Nominal
8	PromiseM	Numeric	8	0	Minimun: Providing customer service as promised	None	99	8	Right	Scale
9	PromiseD	Numeric	8	0	Desired: Providing customer service as promised	None	99	8	Right	Scale
10	PromiseL	Numeric	8	0	LANXESS: Providing customer servie as promised	None	99	8	Right	Scale
11	DependM	Numeric	8	0	Minimun: Dependability in handling customers' service p...	None	99	8	Right	Scale
12	DependD	Numeric	8	0	Desired: Dependability in handling customers' service pr...	None	99	8	Right	Scale
13	DependL	Numeric	8	0	LANXESS: Dependability in handling customers' service ...	None	99	8	Right	Scale
14	FrsttimeM	Numeric	8	0	Minimum: Performing customer service right the first time	None	99	8	Right	Scale
15	FrsttimeD	Numeric	8	0	Desired: Performing customer service right the first time	None	99	8	Right	Scale
16	FrsttimeL	Numeric	8	0	Lanxess: Performing customer service right the first time	None	99	8	Right	Scale
17	PrsdtimeM	Numeric	8	0	Minimum: Providing customer service at the promised time	None	99	8	Right	Scale
18	PrsdtimeD	Numeric	8	0	Desired: Providing customer service at the promised time	None	99	8	Right	Scale
19	PrsdtimeL	Numeric	8	0	LANXESS: Providing customer service at the promised ti...	None	99	8	Right	Scale
20	RecordsM	Numeric	8	0	Minimum: Maintaining error-free records	None	99	8	Right	Scale
21	RecordsD	Numeric	8	0	Desired: Maintaining error-free records	None	99	8	Right	Scale
22	RecordsL	Numeric	8	0	LANXESS: Maintaining error-free records	None	99	8	Right	Scale
23	InformM	Numeric	8	0	Minimum: Keeping customers informed about when cust...	None	99	8	Right	Scale
24	InformD	Numeric	8	0	Desired: Keeping customers informed about when custo...	None	99	8	Right	Scale
25	InformL	Numeric	8	0	LANXESS: Keeping customers informed about when cu...	None	99	8	Right	Scale
26	PromptM	Numeric	8	0	Minimum: Prompt customer service	None	99	8	Right	Scale
27	PromptD	Numeric	8	0	Desired: Prompt customer service	None	99	8	Right	Scale
28	PromptL	Numeric	8	0	LANXESS: Prompt customer service	None	99	8	Right	Scale

FIGURE 12: SCREENSHOT PASW 17 FOR MAC

As mentioned in the above chapters, the 1994 version of SERVQUAL was selected for use in this study. In the current study, several modifications and adoptions were made compared to the 1994 version of SERVQUAL in order to examine specific problems that have been reported with previous versions of the instrument. Part B of the questionnaire was structured according to the 3-column format as discussed in Chapter 3.4.1. Each of the 22 items was asked from three different angles. For example, the first item of Part B read *Providing customer service as promised* and in column A it was asked what is the minimum level of service, column B inquired about the desired service level, and column C requested the perception of Lanxess' service level concerning the item. The variable was therefore consequently named Promise*M* for item 1 and column A, *PromiseD* for item 1 and column B, and

Promise*L* for item 1 and column C. The labelling for the respective items were: *Minimum: Providing customer service as promised; Desired: Providing customer service as promised; LANXESS: Providing customer service as promised.* This systematic approach was analogously applied to all 22 items of the SERVQUAL battery in Part B of the questionnaire. A detailed description can be found at the end of Appendix A.

As far as the measurement levels of the variables are concerned, interval or ratio variables form the input for a classical factor analysis that will later be performed. A Likert scale, which registers the degree of agreement with a particular statement on the basis of a limited number of response categories (7), will, as Janssens et al. (2008) state, produce an ordinal variable and thus does not qualify for a factor analysis. However*, research has shown that the use of these types of scales in factor analysis does not lead to unreliable results* (Janssens et al., 2008, 246). Thus, the measurement level of scale is applied.

In order to assess the internal validity of calculating customer service quality with the SERVQUAL approach a summary measure of overall customer service quality was added to the questionnaire. This question, 23 in part B, was named as *QASQL* and labelled *Overall customer service quality of LANXESS.*

Further, attention was given to a discussion raised in Chapter 3.4, which addresses whether performance only or difference scores offer the right measure for service quality. As the research follows the recommendation of the 1994 adoptions (Parasuraman et al.), the questionnaire has been structured according to the three-column format. It is required to compute the perceived-desired and the perceived-

minimum differences to respectively quantify the *Measure of Service Superiority* and the *Measure of Service Minimum*. However, in order to have the ability to explore the discussion between gap scores and performance only score, the research follows the path also used by Parasuraman et al. (Parasuraman et al., 1991a) and initially analyses difference scores based on both performance minus desired ratings and performance minus minimum ratings as well as desired and perception ratings.

In order to compute these different variables the function *Transform – Compute Variables* of PASW was leveraged. The difference per item was calculated and newly named and labelled. For example, the respondents' perception of Lanxess' service level to item 1 (*PromiseL*) was reduced with the respondents' desired service level to item (*PromiseD*). The result was named *PromiseLD* in PASW's variable view and labelled *LANXESS-Desired: Q1*. Accordingly, the difference between the perception (*PromiseL*) and the minimum acceptable service level (*PromiseM*) was calculated and named Promise*LM* and labelled *Lanxess – Minimum: Q1*. As a result 44 variables were additionally computed (2*22).

One of the research objectives is to examine whether the SERVQUAL scale exhibits the same 5 dimensional structure in a highly tangible business-to-business environment. Therefore, the five-factor SERVQUAL measure was considered as the initially hypothesized model to be tested. In order to test and validate or negate this hypothesis the items pertaining to SERVQUAL were mapped to 5 service quality dimensions as shown in Table 3, where the item numbers correspond to items in Part B of the questionnaire. This mapping reflects the recommendation to SERVQUAL by Parasuraman, Zeithaml, and Berry in 1994.

Dimension	Label	Item Number
Reliability	Reliability	Items 1-5
Responsiveness	Responsiveness	Items 6-9
Assurance	Assurance	Items 10-13
Empathy	Empathy	Items 14-18
Tangibles	Tangibles	Items 19-22

Table 3: SERVQUAL's DIMENSION, LABLES, AND ITEM NUMBER

Service quality scores with SERVQUAL are usually calculated for each dimension by summing respondent ratings for each item within the dimension and dividing the sum by the number of items in the dimension. Service quality was calculated in this manner for each dimension using performance-only scores and difference scores based on performance minus expectations and performance minus minimum. For instance, the performance only score for Reliability is named *ReliabilityL*, labelled *Reliability Performance Lanxess* and calculated (Mean (PromiseL; DependL; FrsttimeL; PrsdtimeL; RecordsL)). The other performance-only dimensions were named accordingly. The difference scores per dimension (perception-desired) were named *ReliabilityLD* and labelled *Reliabilty Lanxess – Desired* and calculated accordingly (Mean (PromiseLD; DependLD; FrsttimeLD; PrsdtimeLD; RecordsLD)). The same approach was utilized for the difference score perception – minimum, naming the variable *ReliablityLM,* labelling it *Reliability Lanxess – Minimum* and calculating it (Mean (PromiseLM; DependLM; FrsttimeLM; PrsdtimeLM; RecordsLM)). This procedure was conducted for all dimensions.

As stated above all analyses on reliability and validity were conducted with the help of PASW. Yet, PASW is not sufficient for performing structural equation modelling for the confirmatory factor analysis. Several readily available statistical programs are convenient and available. Traditionally, as Hair et al. (2010) point out, the most

widely used program is LISREL (LInear Structural RELations) and AMOS (Analysis of Moment Structures). Hence, all other analysis was conducted with the help of SPSS and additionally the research used AMOS as the structural equation modelling software. AMOS is a program that gained popularity because in addition to being a module in PASW, it was also among the first SEM programs to use a graphical interface for all functions so that a researcher never has to use syntax commands or computer code (Hair et al., 2010).

3.9 Methodological Dilemmas and Limitations

The methodological dilemmas and research limitations of the suggested research approach are mainly grounded in the SERVQUAL instrument itself. SERVQUAL has been widely applied and it is highly valued not only among practitioners but also among academics as the above sections demonstrated. Therefore, any critique of SERVQUAL must be seen within this broader context of strong endorsement. Nevertheless, several authors (e.g. Cronin Jr. and Taylor, 1992) have summarised and structured the discussion of several criticisms, which have been voiced about SERVQUAL or have been experienced in the application of the tool. This research relies on the general structure of Buttle's 1995 article *SERVQUAL: review, critique, research agenda*, which was published in the European Journal of Marketing. Beyond that this section considers theoretical as well as operational challenges with SERVQUAL neither named nor identified in Buttle's work.

Buttle's critique (1995) names a number of theoretical and operational issues alluded to by researchers and practitioners. Buttle (1995) hereby deserves the credit for aligning and structuring the different criticisms concerning the SERVQUAL instrument using the following concept:

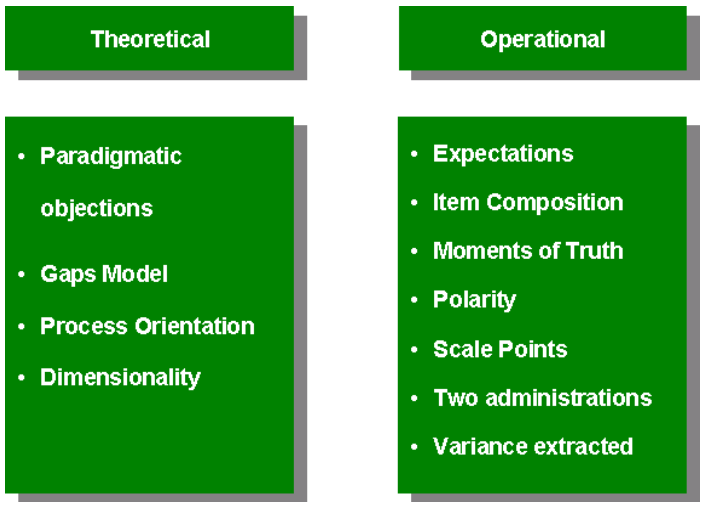


FIGURE 13: ILLUSTRATION OF SERVQUAL'S CRITICISM

Each of the criticisms is briefly examined below. According to Cronin Jr. and Taylor (1992), SERVQUAL is paradigmatically flawed because of its adoption of the disconfirmation model. The disconfirmation model, as explained above, assumes that customer satisfaction is operationalised in terms of the relationship between expectations and outcomes. Cronin Jr. and Taylor criticise Parasuraman et al. for their hesitancy to define perceived service quality in attitudinal terms (Buttle, 1995). The attempts to differentiate service quality from consumer satisfaction, even while using the disconfirmation format to measure perceptions of service quality, are not consistent with the differentiation expressed between these constructs in the satisfaction and attitude literature. Cronin Jr. and Taylor therefore suggest that a different model, the adequacy-importance model of attitude measurement, should be adopted for service quality research. Further, Andersson (1992) criticises the

paradigmatic objections of Parasuraman et al.'s work by referring to its highly inductive style in that the SERVQUAL research moves from historically situated observation to general theory.

Secondly, Buttle (1995) groups the theoretical criticisms around the gaps model. This related set of criticisms refers to the value and meaning of gaps identified in the disconfirmation model. Buttle (1995) quotes the work of Babakus and Boller (1992) who find the use of a "gap" approach to service quality measurement "intuitively appealing" but suspect that the "difference scores do not provide any additional information beyond those already contained in the perceptions component of the SERVQUAL scale". A further criticism on the gaps model is that SERVQUAL fails to capture the dynamics of changing expectations. Grönroos (1992) recognises this weakness in Parasuraman's understanding of service quality and calls for a new phase of service quality research to focus on the dynamics of the process (Buttle, 1995). Buttle (1995) identifies a further weakness of the gaps and disconfirmation model, because customers will often criticise poor service performance and not praise exceptional performance, but SERVQUAL assumes that positive and negative disconfirmation are symmetrically valid.

In his 1982 work Grönroos highlights three components of service quality: technical quality (what?), functional quality (how?), and reputational quality. Other critics of SERVQUAL argue, that the model focuses too much on process orientation rather than on the outcome (Grönroos, 1982). In defence of SERVQUAL, Buttle (1995) refers to the work of Higgins et al. (1991) that outcome quality is already incorporated within the different dimensions of SERVQUAL such as reliability.

Additionally, much critique surrounds SERVQUAL's five RATER factors: reliability, assurance, tangibles, empathy, and responsiveness. The literature offers several alternative conceptualisations of service quality. Buttle (1995) discusses in detail the dimensionality, its contextual stability, the item loadings, as well as the item intercorrelations. He (1992, 10) summarises that *SERVQUAL's five dimensions are not universals; the number of dimensions comprising service quality contextualises; items do not always load onto the factors which one would a priori expect; and there is a high degree of intercorrelation between the five RATER dimensions.*

Buttle (1995) also lists several operational criticisms on SERVQUAL. Special attention is hereby placed on the expectations battery of SERVQUAL. Teas (1993) raises concerns over the respondents' interpretation of the expectations battery. Teas further contends that a considerable percentage of the variance of the SERVQUAL expectations measure can be explained by the different interpretation of the respondents (Buttle, 1995). Correspondingly, the expectations component of the instrument lacks discriminant validity; hence, SERVQUAL assumes that an expectation score of a first-aid establishment is equivalent to an expectation score of a modern hospital, even though in absolute terms, this is not the case.

A further critique of SERVQUAL is the item composition of the SERVQUAL scale. Carman (1990) used 40 items in a hospital services study, because it has become clear that four to five items per factor are often inadequate to capture the variance within, or the context-specific meaning of each dimension (Buttle, 1995). This challenge being SERVQUAL's generic nature is also clearly expressed in the work of Kurtz and Clow (1998). They (1998) conclude that since SERVQUAL is not

industry specific, it does not measure variables, which may be industry specific. Parasuraman et al. (1991b) acknowledge that context-specific items can be used to supplement SERVQUAL, but the items should be chosen in a similar form to the existing SERVQUAL items.

Buttle (1995) clusters and names the next two operational weaknesses of SERVQUAL, which are moments of truth and polarity. Again, based on Carman's study (1990), he states that the model of moment-of-truth (see Chapter 2) is not sufficiently factored into the SERVQUAL instrument. Parasuraman et al. (1991) counter this argument by declaring the service quality construct. Hence, SERVQUAL as well as a more global construct are not directly connected to particular incidents.

Even though Churchill (1999) postulates that bias responses might be reduced by wording statements positively as well as negatively, the wording of SERVQUAL's 22 items has its critiques. Babakus and Boller (1992) use a factor analysis of SERVQUAL data to show that all negatively-worded items loaded heavily on one factor while all positively-worded items loaded on another. Buttle (1995) concludes that this item wording creates data quality problems, and questions the dimensionality and validity of the tool.

Further criticism is evoked by the usage of the seven-point Likert scale. Lewis (1993) believes that the lack of verbal labelling may cause respondents to overuse the extreme ends of the scale and suggests this could be avoided by labelling each point. Buttle (1995) alludes that this scale point-critique is rather generic than specific, but it also reveals a possible shortcoming of the SERVQUAL instrument.

Regarding the point two administrations Buttle (1995) points out that respondents might be bored and sometimes confused by the administration of the two versions of SERVQUAL (expected vs. perceived quality). By doing so he (1995) refers to the work of Carman (1990), Grönroos (1993), and Lewis (1993). Further Clow and Vorhies (1993) allude to the problem of measuring consumers' expectations after a service has been provided. They (Clow and Vorhies, 1993) state that this might bias consumers' response, since customers tend to report higher scores for their expectations, so there would be a negative gap between expectations and perceived level of service.

Lastly, Buttle (1995) refers to the challenges concerning construct validity. He (1995) claims that the modified scales of SERVQAUL (e.g. Babkus and Boller, 1992, Carman, 1990) tend to produce higher levels of variance extracted. The higher the variance extracted, the more valid is the measure. However, this criticism was rarely quoted again and despite all criticism, SERVQUAL remains a widely used tool and its reputation and milestone character cannot be stressed enough.

3.10 Reflexivity, Power and Ethics

Coolican (1992) emphasises the importance of considering ethics during the whole research process since *'it is difficult to conduct much research at all without running into ethical arguments'* (Coolican, 1992). Therefore, the thesis considers a number of different ethical issues and identifies rules and ideas to prevent ethical dilemmas at all stages in the study (Ghauri and Grønhaug, 2005). The research is based on the

Bradford Code of Practice for Ethics in Research (2003). This guideline offers an overall understanding of research ethics and provides a code of practice for all ethical questions with a special emphasis on the ethical treatment of participants.

In the proposed research the researcher-participant relationship is the most sensitive one in the process of research in business studies (Ghauri and Grønhaug, 2005). Kelman (1972) argues that there is an inevitable power discrepancy inherent in the social role of the researcher due to his specialized knowledge and responsibility in defining the conditions of research. However, the thesis follows the trend to supersede "subject" with "participant" to characterise an individual who participates in research and suggests an equality of the role relationships in research (Schuller, 1982). This approach is supported by Bryman and Bell (2003). They state that a business researcher often deals with people belonging to high management levels, academics or successful managers on an at least even level.

Further, the focus lies on protecting the interest of study participants rather than the research community or the wider society (Kimmel, 1988). This is because the research-participant relationship is the most important one to consider during the research process, especially if the data collection is based on surveys (Ghauri and Grønhaug, 2005). Hence, the following ethical issues are especially addressed during the research process:

- Coercion, or the exercise of undue pressure towards a marketing manager in order to induce participation, since the survey participants might be customers or to-be customers;
- Deception, or misleading of a participant on what the study is about;
- Intrusion of privacy, or asking participants questions detrimental to their self-interest;

- Breaching of confidentiality, or allowing information about a marketing strategy to be passed on to a competitor;
- Stress, or exposing managers to psychological uneasiness; usage of special equipment, or building pressure through tape recorder or video equipment.

These issues are addressed by creating benefit for the participant, respecting participants' rights, and informed consent. Although as it is necessary to remember that the primary purpose of a participant contact is to collect data, there are a number of ways in which people taking part may benefit from the research or be personally empowered (Arksey and Knight, 1999). Often respondents have received satisfaction from the encounter with researchers (Bower and de Gasparis, 1978) as contributing to a worthwhile endeavour can be gratifying. Thus the data collection stage, mainly the survey, which was personally delivered, commenced with an introduction of the researcher, the name of the research organisation, and a brief description of the purpose and benefit of the research. Cooper and Schindler (2003) state that knowing why one is being asked questions improves cooperation through honest disclosure of purpose. The researcher informed the participant about the whole context of the research project, the background and the usage of the final thesis.

The implementation of the survey used a drop and collect approach which entailed the personal delivery of individual surveys during routine business encounters and the batch delivery of surveys on request. This approach provided a wide reach to the survey allowing as many professionals in the target groups as possible the opportunity to be included.

The delivery of the survey meant that the researcher was visible and thus there was an element of personal appeal rather than an impersonal, occasionally perceived as

cold approach. By distributing the survey in this way, everyone had not only the opportunity, but also the choice and the autonomy to decide whether to participate. The crucial point about individual choice is that there is no sense in which respondents could be influenced by the researcher about their decision to take part or not. The benefit of autonomy of the respondents is that if the researcher had been present throughout completion of the survey, the respondents may have felt obliged to complete it and done so in a negative frame of mind. They may have rushed the completion, or may have felt some pressure towards a halo effect in the presence of the researcher. Similarly related to this issue, respondents may not have felt assured of anonymity and confidentiality. There was also a danger of the immediate time constraint leading to a rejection of the request to participate. Finally, it seemed inappropriate to mix the nature of the professional business encounter with the completion of a somewhat unrelated activity which could have been considered intrusive of the business relationship. Overall, despite the limitations of drop and collect, the implementation gained cooperation within the limited sampling frame in this industry characterised by relatively few, high value customers and in this sense led to an appropriate and useful sample that met the objectives of the research for the DBA.

Additionally, participants gave their informed consent before participating in the research. Even though Arksey and Knight (1999) suggest that it is preferable to have written agreement demonstrating that someone has volunteered to participate, the DBA thesis followed the approach Blumberg et al. (2005) suggest. For most business research oral consent is adequate and the willingness of a respondent to participate in

research after the researcher has shared the full information on the research project is often interpreted as informed consent (Blumberg et al., 2005).

Privacy and confidentiality are two ethical issues that are crucial to social researchers who, by the very nature of their research, frequently request individuals to share their thoughts, attitudes, and experiences (Kimmel, 1988). Thus, the ethical issues related to the recognition of respondents' rights to privacy and the assurance that the information they provide remains confidential is of outstanding importance. This is assured through neither revealing respondents' names nor their company's name. All results are presented or published as averages of all of the individual's responses as suggested by Parasuraman et al. (1985).

3.11 Recapitulation

Chapter 3 served as a key corner stone for establishing the research's structure and built up based on an in-depth analysis why this particular structure has been chosen by the researcher. It was outlined how the results of an exploratory research phase will be utilized during the course of this research. Further, it was demonstrated that the chosen approach supports answering the research question.

Due to the nature of a business-to-business environment it was demonstrated why a quantitative-descriptive research method is appropriate. The SERVQUAL survey instrument offers the researcher a clearly structured and proven approach that meets the requirements and expectations of this research as detailed in Chapters 1 and 2.

Panels were identified as a crucial element of the research process; the survey instrument (method) includes the results of the panels (results).

Furthermore, the survey design and the questionnaire development were detailed while also providing a further overview of the research route. A flow diagram illustrated the timeframe of certain parts of the research process to highlight the milestones of the thesis.

Pre-testing the SERVQUAL questionnaire was explained to be a necessary step towards optimizing the research instrument. Reference was made to Parasuraman, Zeithaml and Berry and their advice to apply the instrument in its entirety as much as possible. Based on these recommendations of the original authors the chapter elaborated on the comprehensive pre-testing phase conducted by the researcher. The panel format was selected to challenge the survey's design and set-up with a group of experts from the nylon intermediates industry as well as academics. This panel discussion proved to be of particular benefit as the results of the discussion facilitated the application of the SERVQUAL model in a highly tangible business-to-business environment. The slightly adapted SERVQUAL statements were agreed upon with the two expert panels, which led to modifications in terms of content, length and structure of the research instrument. It was detailed how the adapted design fully supports the research objectives and facilitates answering the research question.

The use of the whole population of the European nylon intermediate industry as the sample size for the research process was proven based on the respective number of players in the market. Additionally, it was manifested that the relationship between two companies is characterised as a set of "interwoven business strands" whereby

these links represent a series of “exchange episodes”. It was shown that precise measurement of customer service in business-to-business markets entails multiple key informants representing different functional areas and organisational levels in the customer’s firm.

While comparatively little has been written about the “drop and collect” survey technique, following this data-collection approach was proven to serve the set up within the European nylon intermediates industry. This decision rested upon balanced reasoning of advantages and disadvantages of this data collection method. Particular focus was placed on the response rate of different techniques as well as their reliability.

The data analysis process was outlined in detail while special attention was placed on how this phase will facilitate answering the research question. Due to the strong link to Parsuraman’s et al. SERVQUAL concept the analysis of the derived data will be done according to the suggested route of Parasuraman et al. (1988). Based on the original thoughts regarding data analysis of SERVQUAL it was argued to follow this well-established route for analysing the data that will be assessed in the research project. The prerequisites and the process for the analysis of reliability and validity were discussed and demonstrated. The detailed explanation of the general concept of factor analysis served as a crucial basis for applying this method in the later analysis phase of the research project. Special attention was put on both the exploratory as well as the confirmatory factor analysis approach.

Through addressing the methodological dilemmas and research limitations of the suggested research approach, it was elaborated that these are mainly based on the

SERVQUAL instrument itself. This was further substantiated by referring to several authors who have summarised and structured the discussion of several criticisms experienced in the application of the tool. The discussion followed the general structure of Buttle's 1995 work. Shortcomings and limitations of SERVQUAL were highlighted yet reference to wide application not only among practitioners but also among academics substantiated the high value of this approach. Any critique of SERVQUAL was judged to be within the broader context of strong endorsement.

Discussing and highlighting reflexivity, power and ethics issues that may arise during or after a research process concluded the chapter. Ensuring confidentiality and effective management of the research-participant relationship was demonstrated to be of major importance for the research project.

CHAPTER 4 – RESULTS

The nylon intermediates market is a highly tangible business-to-business market that is characterised by a high concentration of suppliers and buyers. More than 1,000,000 metric tons of nylon intermediates are sold yearly to roughly 60 customers in Europe, which represent 90 per cent of the total demand. This research focuses on Lanxess, a key supplier within this highly tangible transaction-oriented market, and addresses the strategic challenges of customer service and its quality. Based on intensive research, Parasuraman, Zeithaml and Berry developed a theory, which is widely applied and commonly used in business-to-consumer markets. This thesis aims at leveraging Parasuraman, Zeithaml, and Berry's SERVQUAL concept in the European nylon intermediates business and market setting and has – as detailed in Chapter 1.3 – the following objectives:

- For the first-time, reveal how Lanxess' customer service is perceived by its customers and quantify these findings

- Evaluate the service dimensions and assess which service dimension of the customer service process is considered to be of high or low importance for the customers

In order to extend the use of theory to a specific application and thus contributing not only to the practice of management but also to the application of theory, the thesis also has the following objectives:

- Develop and validate a slightly adapted SERVQUAL instrument for the nylon intermediates industry

- Assess the usefulness and adaptability of SERVQUAL as a tool in a low involvement, highly transaction oriented business-to-business market

The overall aim of the thesis is thus to assess and validate quality and satisfaction theory to enhance the management of competitive advantage in the sector of the European nylon intermediates industry. In order to fulfil this aim a slightly adapted SERVQUAL instrument was developed and applied to foster the understanding of the applicability and robustness of the SERVQUAL scale in an untouched business-to-business setting. This chapter assesses the research objectives in-depth.

At the beginning of this chapter it is revealed how customers perceive Lanxess' customer service. This first-time analysis takes the characteristics of the respondents, their overall assessment of the service quality of Lanxess as well as the individual items of the SERVQUAL battery into account. Distinction is made especially with respect to the duration of the customers' business relationship with Lanxess as well as the company size (Chapter 4.2).

Secondly, the chapter answers the next research objective and evaluates which service dimension of the customer service process is considered to be of high or low importance for the customer. Based on the cronbach-alpha reliability test, the sub-chapter starts with the analysis of how Lanxess' customer service is perceived by its customers per dimension. The findings are quantified and analysed in detail and referenced to each individual SERVQUAL item. Further reference is also made to the different dimensions as well as the influence of the respondents' profile (Chapter 4.3).

In order to extend the use of theory to a specific application and thus contributing not only to practice of management but also to enhance theory, the validation process of the slightly adapted SERVQUAL instrument for the nylon intermediates industry is conducted in detail. This addresses the third research objective. The evaluation of the appropriateness of the measurement model is based on the analysis procedures introduced in Chapter 3. In addition to the detailed reliability analysis, exploratory as well as confirmatory factor analyses are conducted.

However, prior to addressing the research objectives in the outlined way the profile and characteristics of the respondents are described and analysed.

4.1 Respondent Analysis: Profile

The nylon intermediates industry achieving a turnover of slightly above 3 billion Euro per year is characterised by a dense concentration of sellers and a high concentration of buyers. The total population of companies in Western Europe using the nylon intermediates material is approximately ninety, of which roughly 60 customers in Europe represent 90 per cent of the total demand in terms of volume. Additionally the actual questionnaire requires the respondent to have used the customer service of Lanxess, so that the population was limited to seventy companies in Europe. Therefore, the thesis followed the recommendation of Collis and Hussey (2003) and others to use this number of companies as the sampling frame. The question whether to use one or multiple key informants, and identifying those informants in one company, is present in designing any organizational survey,

regardless of the survey's focus (Kumar, 2005). Measuring how well one company serves another requires assessing the quality of potential companies. Customer service, as conceptualised in the research and as suggested by Parasuraman (1998), represents the quality of the entire fabric of interwoven business strands linking selling and buying firms. Therefore, precise measurement of customer service in business-to-business markets requires multiple key informants representing different functional areas and organisational levels in the customer's firm. This approach was followed during the data collection phase by enlarging the sampling frame to multiple production managers, buyers and divisional heads or owners of nylon-intermediates buying companies in Europe.

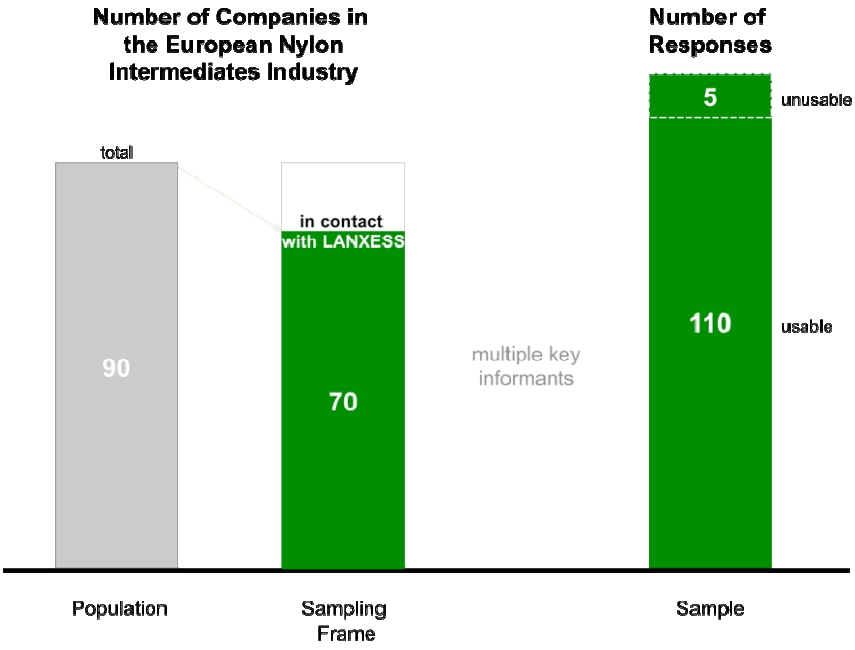


FIGURE 14: ILLUSTRATION OF SAMPLE

With the help of the "drop and collect" survey technique 115 filled questionnaires could be obtained. Participants received the questionnaires in private encounters mostly in connection with regular customer visits conducted by the researcher. In addition to interviews with a key customer contact, the researcher also had access to

other managers of participating organisations. For example, the researcher handed a questionnaire to the purchasing manager of one company and that purchasing manager agreed to also distribute further questionnaires to the general management and other managers within the organisation. 120 hard copy questionnaires were distributed and 12 participating companies asked for an electronic version of the questionnaire. A solid response rate is therefore difficult to determine.

Part A of the questionnaire asked a series of general questions which aimed at establishing the necessary background of each individual participant and their respective company. For later clustering purposes, size of company (Q1), departmental affiliation and job title (both Q2) were enquired. Furthermore, Question 3 determined how long the respondent has been dealing with Lanxess while Question 4 addressed the frequency of contact with Lanxess. The remaining questions of the questionnaire's Part A aimed at gaining general insight regarding the customers' amount and frequency of interaction with other companies' customer services in similar, tangible business-to-business environments (Q5 and Q6). The last question (Q7) was an open-ended question, asking participants to state which company they are familiar with provides the best customer service. The purpose of this question was to ascertain which companies' customer service the respondents perceive to be best; the mention of Lanxess at this point was feasible.

The participants' responses for Questions 1-6 are illustrated in Table 4 and analysed briefly in the following chapters. The answers to Question 7 are analysed and illustrated separately. From the 115 returned and filled-in questionnaires, 110 usable questionnaires were collected. This number exceeds the minimum recommended one hundred observations for a factor analysis (Janssens et al., 2008) and is in line with

the suggested number of five cases for each studied item as stated by Tabachnick and Fidell (2001).

	% of total respondents (n = 110)
Company size in terms of employees	
up to 50	13,6
51-200	31,8
201-500	22,7
above 500	31,8
Department / job assignment	
General Management	19,1
Procurement	47,3
Production	10,9
Marketing	13,6
Sales	5,5
Others	3,6
Duration of business relations to Lanxess	
less than a year	11,8
1-5 years	40,0
more than 5 years	47,3
n/a	0,9
Frequency of contacts to Lanxess	
daily	6,4
weekly	40,9
monthly	40,0
quarterly	11,8
n/a	0,9
Number of industry contacts similar to Lanxess	
up to 2	29,1
3 – 5	52,7
6 – 10	11,8
above 10	4,5
n/a	1,8
Frequency of contacts to those industry contacts	
daily	5,5
weekly	41,8
monthly	36,4
quarterly	13,6
n/a	2,7

TABLE 4: RESPONDENT'S PROFILE

4.1.1 Company Size

As shown in Table 4, 31.8 % of participants of the study worked in companies with more than 500 employees. Nevertheless, an equal number of participants belonged to the group of companies with employees ranging from 51 to 200. Participants of small companies (below 51 employees) and companies between 201 to 500 employees constituted 13.6% and 22.7% respectively. Mainly persons employed in the procurement department of nylon intermediates companies completed the questionnaire (47.3%). This group was followed by employees working in General Management (19.1%) and Marketing departments (13.6%). This result is in line with the expectation since most of the researcher's contacts belong to procurement functions. Additionally, small firms regard buying nylon intermediates as a key cost component of their operations and hence consider it to be strategic. Therefore, several general managers themselves are in charge of this procurement activity. Further filled in questionnaires could be collected form production personell (10.9%) and members of the sales force (5.5%).

4.1.2 Department and Duration of Business Contact

Question 3 asked how long the respondent had been dealing with Lanxess while Question 4 addressed the frequency of contacts with Lanxess. Not surprisingly the majority of respondents had long lasting relationships with Lanxess (87.3%). More than half of these respondents had business relations with Lanxess exceeding 5 years (47.3% of the total sample). Many economists would describe the characteristics of the European nylon intermediates market as almost oligopolistic. Therefore, long-lasting business relations seem coherent. Only 11.8% of the respondents indicated

business relations to Lanxess of less than a year. The vast majority of participants claimed to be in regular contact with Lanxess on a monthly (40.0%) or even weekly (40.9%) basis. From an operational point of view this is comprehensible since shipments are usually managed on a monthly or even weekly basis while prices are discussed monthly. Further 6.4% of respondents claimed to be in daily contact with Lanxess, whereas 11.8% stated to be in contact with Lanxess on a quarterly basis only.

4.1.3 Number and Frequency of Industry Contacts

The next question asked for the number of industry contacts similar to Lanxess. The respondents' profile showed that the majority of participants had contacts to 3 to 5 similar companies (52.7%). Further 29.1% of respondents answered to have up to 2 similar industry contacts. 18.1% of participants stated to have more than 5 similar industry contacts. A similar responds profile was observed when asking how often the participant is in contact with these companies. Similar to question Q4, the majority indicated to be in contact with these respective companies at least once a month 83.7%, whereby 5,5% claimed to be in daily contact, 41.8% in weekly contact and 36.4% in monthly contact. This seems to be in line with the answers given to question Q4. Therefore, no apparent significant unequal treatment between Lanxess and its competitors can be derived based on the frequency of contact.

The last question, Question 7, asked participants to state which company they are familiar with provides the best customer service. The purpose of this query was to ascertain which companies' customer service the respondents perceive to be best; at this point it was an option to choose Lanxess.

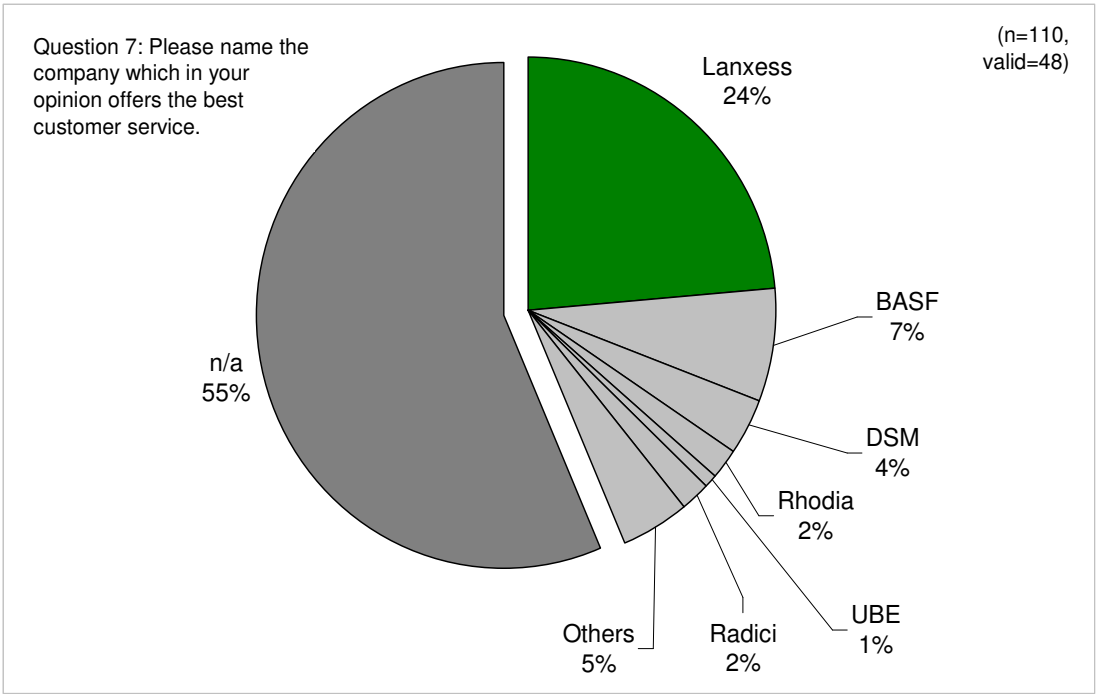


FIGURE 15: COMPANY PROVIDING THE BEST CUSTOMER SERVICE

The answers to Question 7, which are illustrated in Figure 15, show a very different picture than the answers to Questions 1 to 6. The number of missing answers (n/a) to Questions 1 to 6 was very low, with a maximum of 2.7% for Question 6. However, when participants were asked to name the company, which in their opinion offers the best customer service, the majority of participants refused to name any company. Almost a quarter of the total population named Lanxess as the company with the best customer service. If only the given responses are considered which constitute 45% of the total population, then the Lanxess' customer service is regarded as best in class by more than half of the respondents (54%). The customer services of BASF and DSM are regarded as best in class by 8% of the total population (17% of responses) and 4% of total population (8% of responses) respectively.

The high share of missing answers might be explained by several reasons. Firstly, the respondents did not want to offend the questioner, as the participants were well

aware, that the research is done “by a Lanxess employee”. Therefore, instead of naming a competitor’s customer service best in class the participant might have preferred not to name any company at all. This reason would be in line with observations made by Dillmann (1999) which suggest that positive feedback is given faster than negative. The second reason for the high portion of missing data might be linked to the European Nylon intermediate market structure. Since the number of suppliers is limited and the market characteristic is oligopolistic, participants might not want to reveal too much information. Since many customers handle their choice of suppliers and the suppliers’ share of delivery confidentially, the respondent might prefer not to name a supplier – if it is not Lanxess – to avoid disclosing too much information about the supplier portfolio.

Nevertheless, Question 7 shows that a quarter of the participants rate Lanxess’ customer service as best in class. In order to understand and to validate the customers’ perception of Lanxess’ customer service the next chapter analyses the results of the questionnaire in more detail.

4.1.4 Reflection

The sampling frame comprised organisations in the European nylon intermediates industry. The total industry consists of 90 organisations (MacDonald, 2008) and from this, the sampling frame included 70 organisations covering 78% of the market. These organisations were easily identifiable through organisational records. The base was considered ideal for taking a sample as it was clear that these organisations comprised contacts that could provide an informed opinion concerning the service of Lanxess which was the objective of selecting this sample. Thus, the respondents

were a sample from a sub-set of the full population of buyers, production managers, divisional heads and owners in the sector and they were from companies targeted to ensure that the sample and thus responses were fit for purpose. Regarding fit for purpose, the objective was to obtain the opinions of those who had a working relationship with Lanxess in the past. Therefore multiple responses from an organisation were obtained to reflect the spread of distribution of Lanxess' customer base and that of the customer companies that were covered. The high number of returned questionnaires implied that compliance was very good and that those asked, generally participated. Top customers which are usually larger organisations and have more contact with Lanxess on different levels, naturally received more surveys. Thus the coverage represented not the fact that they were a customer only but also the intensity, or importance (magnitude,) of the company in relation to Lanxess. The sample represents those who have a professional relationship with Lanxess and therefore provides a valid base for an opinion of Lanxess which reflects the needs of the study. On the other hand there could be some skewness in the sample with some organisations having been covered more than others. This however reflects the reality of the nature of the market place Lanxess interacts within. After all, the unit of analysis was the individual rather than the organisation, giving further weight to the inclusion of all respondents who were willing to give their view on the quality performance of Lanxess.

In addition, the qualitative phase was very helpful in the verification (and explanation) of the survey outcomes. In terms of reliability the results were considered by panel participants in this phase as appropriate for discussion and so

there is every reason to confirm the face and construct validity of the outcome of the survey so that the research has reliably addressed what it was intended to cover.

Limitation of the data collection approach came from the population itself. The addition of further categorisation questions and the respective analysis would have given more insight into the nature of the respondents. To have asked for their number of years of experience in their company, in the sector and as a buyer would have been helpful in developing a more insightful picture of the sample. It could also have covered the detailed role of the respondent within their organisation which would have facilitated a comparison of the perception of different organisational roles concerning Lanxess. Conversely, there is no guarantee that there would have been an appropriate number of respondents in each category to ensure the statistical robustness of this analysis.

4.2 Perception of Customer Service and Quantification

Chapter 4.2 addresses the first research objective in detail and reveals how its customers perceive Lanxess' customer service and quantifies the findings. The analysis takes the following into account: characteristics of the respondents, their overall assessment of the service quality of Lanxess as well as the individual items of the SERVQUAL battery. Distinction is made especially with respect to the duration of the customers' business relationship with Lanxess, the company size as well as the frequency of contacts with Lanxess (Chapter 4.2).

Parasuraman‘s et al. (1994) SERVQUAL instrument was adapted for the assessment of customer service quality in the European nylon intermediates industry. Since the authors recommend that managers should consider implementing a measurement approach that provides separate ratings to assess the desired, adequate, and perceived service quality (Parasuraman et al., 1994), the three-column questionnaire format was selected as the assessment tool. As stated in Chapter 3.3.1 the instrument used a 7-point Likert scale, which was applied in this study. This Likert scale was used three times for each statement to rate the respondents’ adequate service level (Column 1); the desired customer service level (Column 2); and the perceived service level of Lanxess’ customer service (Column 3). Each scale was anchored on both ends with “low” on the lower end of the scale (towards “1”) and “high” at the higher end of the scale (towards “7”). Since the first research objective focuses on the customers’ perception of Lanxess’ customer service the analysis focuses on the described third column. Nevertheless, to value the findings reference is also made to the minimum and desired columns.

However, before analysing and detailing the perception based on the SERVQUAL tool item by item another measurement opportunity for how participants perceive the customer service of Lanxess is applied. This helps to understand the participants’ overall perception of the customer service as well as establishing - in addition to the SERVQUAL results - an opportunity for testing the internal validity of the research approach.

4.2.1 Perceived Overall Service Quality

The final question of the survey asked the participants to rate the overall service quality of Lanxess' customer service on a scale from 1 to 7. If the participant rates the customer service of Lanxess as extremely poor, the rating should be '1', in contrary if Lanxess' customer service is regarded to be excellent then the participants were to chose '7'; or anything in-between.

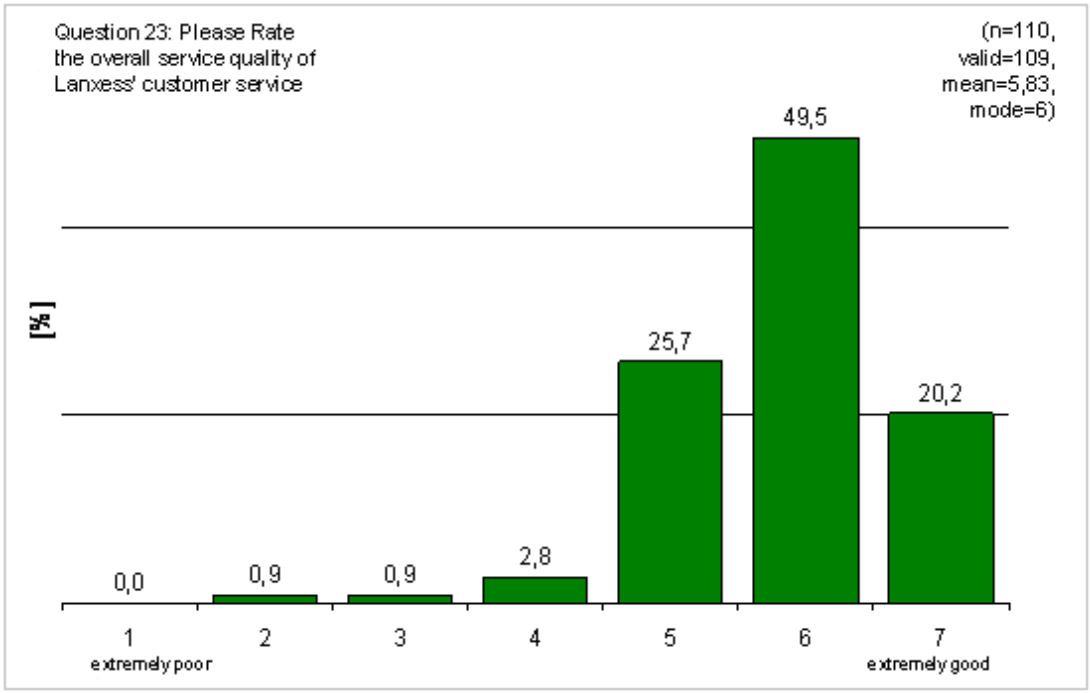


FIGURE 16: LANXESS' PERCEIVED OVERALL SERVICE QUALITY

Question 23 was answered by 109 participants, with only one answer missing. The participants rated the overall service quality of Lanxess based on the 1 to 7 Likert scale with a mean average of 5.83. This shows that the perception of Lanxess' customer service quality is very positive. The standard deviation of .880 supports this observation; less than 5% of the participants evaluated Lanxess' overall customer service equal or below 4. The mode is 6. Almost 70% valued the overall service quality of Lanxess as extremely good or close to extremely good. In order to further

understand and analyse the customers' perception ratings of Lanxess' service quality a series of cross-tabulation analyses was conducted.

		extremely poor	Overall customer service quality Rating					extremely good	
		1	2	3	4	5	6	7	Total
Company Size	up to 200	0	1	0	1	10	25	12	49
	201-500	0	0	1	1	4	13	6	25
	above 500	0	0	0	1	14	16	4	35
	Total	0	1	1	3	28	54	22	109

TABLE 5: PERCEPTION IN RELATION TO COMPANY SIZE

In order to investigate whether the overall customer service rating is the same across the whole sample or if differences exist – for example in relation to the customers' company size – several cross-tabulations were performed. Table 5 shows the company size in relation to the overall customer service rating. Since the sample for companies with employees between 1 and 50 was only 15 it was decided to combine the data with the company size group 51 to 200.

Each group was then tested for differences in the groups' mean service rating with respect to the overall sample. The mean for the overall customer service quality ranking was 5.83 for the whole sample. Interestingly, the data from smaller and medium sized companies gives a slightly higher mean for the overall customer service evaluation. The mean for small companies with up to 200 employees is 5.91, while for medium sized companies (201-500 employees) the mean is calculated to be 5.88. The perceived overall customer service quality is almost the same.

However, the data for bigger companies with more than 500 employees give a mean of only 5.66. The analysis therefore shows that small to medium sized companies

rate the customer service quality of Lanxess significantly better than large scale companies. This observation offers - for the latter managerial application of research's result - valuable ideas and insights (see Chapter 5).

		extremely poor	Overall customer service quality Rating					extremely good	
		1	2	3	4	5	6	7	Total
Business Relation	<= 5	0	1	1	2	17	25	10	56
	> 5 years	0	0	0	1	11	28	12	52
	Total	0	1	1	3	28	53	22	108

TABLE 6: PERCEPTION IN RELATION TO BUSINESS RELATION

In order to analyse if the overall customer service rating is also different with respect to other clusters than company size, another cross-tabulation was performed. Table 6 shows the duration of business contact to Lanxess in relation to the overall customer service rating. Since the number of cases for companies with business relation to Lanxess of 'less than a year' was only 13, these cases were grouped with the company cluster of '1 to 5 years' of business contact. The mean rating for the overall customer service quality significantly differed between these two groups. While the group with business contacts of less than 5 years produced a mean overall quality rating of 5.67, the group of the very loyal long-term customers gave a mean of 5.98. This is in line with several management discussions and beliefs within Lanxess that customers either remain loyal due to good service or get used to the delivered service quality and positively adapt to it over time. In Chapter 5 the discussion of how to use the tool in the future and over-time for managerial purposes is thoroughly addressed.

After analysing the overall rating for the customer service quality, the 22 items of the SERVQUAL battery are analysed.

4.2.2 Perceived Ratings

The *perceived* or sometimes referred to as *performance ratings* of the SERVQUAL items are shown in Table 7. Table 7 shows the items in descending order. The overall average performance rating of the items on SERVQUAL is 5.735. This is in line with other research, including work of White, Abels, and Nitecki (1994) with 5.73 as well as of Mehta and Durvasula (1998) with 5.71. Additionally, the average rating for Lanxess' customer service per SERVQUAL item with 5.735 does not differ significantly from the given and above discussed overall rating of Lanxess' customer service achieving a 5.83.evaluation.

	N	Mean	Std. Deviation
Providing customer service at the promised time	110	5,955	1,087
Knowledgeble employees	109	5,945	0,792
Providing customer servie as promised	109	5,936	0,955
Employees who are consistently courteous	108	5,926	1,039
Performing customer service right the first time	110	5,891	0,989
Giving customers individual attention	110	5,864	1,161
Convenient business hours	109	5,862	0,907
Dependability in handling customers' service problems	110	5,855	0,907
Prompt customer service	110	5,836	1,080
Willingness to help customers	110	5,818	1,042
Sales persons who have a neat, professional appearance	106	5,811	0,937
Modern equipment (e.g. trucks, SAP)	106	5,764	0,911
Ability to respond to customer's request	110	5,745	0,829
Maintaining error-free records	105	5,657	0,959
Visually appealing materials associated with service	109	5,651	1,100
Keeping customers informed	109	5,633	1,006
Employees who deal with customers in caring fashion	108	5,583	1,095
Employees who understand the needs of their customers	110	5,555	0,954
Having the customer's best interests at heart	107	5,542	0,984
Visually appealing offices	100	5,510	0,916
Making customers feel safe in their transactions	109	5,422	1,091
Employees who instill confidence in customers	107	5,411	1,107

Overall average rating	**5,735**

TABLE 7: PERCEPTION RATING PER SERVQUAL ITEM

Means of individual items ranged at the higher end of the scale at 5.955 for ‘Providing customer service at the promised time’ to the lower scale at 5.411 for ‘Employees who instil confidence in customers’. The next four performance items valued highest pertain to ‘Employees who have the knowledge to answer customer questions’, ‘Providing customer service as promised’, ‘Employees who are consistently courteous’, as well as ‘Performing customer service right the first time’.

The 5 items with the lowest rating for Lanxess' customer service pertain to 'Employees who understand the needs of their customers', 'Having the customer's best interests at heart', 'Visually appealing offices', 'Making customers feel safe in their transactions' as well as the already named 'Employees who instil confidence in customers'.

The values for standard deviation are in line with those of other researchers and were discussed in depth in Chapter 4.3. The number of valid responses ranged from 106 to 110 with one exception of only 100 valid responses for 'Visually appealing offices'. This might be explained by the market setting of the European nylon intermediates industry. Although it is a high priority to invite customers to the supplier's respectively Lanxess' location, not all business contacts take this opportunity. Therefore, this lower response rate is reasonable since for the investigated business-to-business setting customer service in form of a face-to-face contact at the suppliers' site is not necessarily required.

In order to evaluate the perception of Lanxess' customer service quality, a comparison with the minimum as well as the desired SERVQUAL scores is required. The analysis focuses on the individual and the overall average of the whole batteries and does not take into account the dimensional discussion that will follow in the forthcoming chapters.

4.2.3 Desired Ratings

Table 8 shows the desired ratings of the SERVQUAL items in descending order. Desired ratings of items on SERVQUAL are high and exhibit a negative skew and

positive kurtosis, consistent with results of other SERVQUAL surveys. The overall average desired rating is 5.768, with means of individual items ranging from a high of 6.464 for 'Providing customer service at the promised time' to a low of 4.611 for 'Visually appealing offices'. This compares to a mean of desired rating for example of 6.02 reported by White, Abels, and Nitecki (1994) and 6.40 reported by Smith (1995). Additionally, the overall desired performance is only slightly above the perceived performance of Lanxess, with 5.768 to 5.735 respectively.

	N	Mean	Std. Deviation
Providing customer service at the promised time	110	6,464	0,786
Providing customer service as promised	110	6,373	0,788
Dependability in handling customers' service problems	110	6,364	0,798
Knowledgeble employees	110	6,345	0,747
Performing customer service right the first time	110	6,318	0,765
Ability to respond to customer's request	110	6,164	0,784
Employees who understand the needs of their customers	110	6,064	0,805
Prompt customer service	110	6,027	1,018
Willingness to help customers	110	5,991	0,991
Giving customers individual attention	110	5,909	0,944
Keeping customers informed	110	5,827	0,966
Having the customer's best interests at heart	110	5,718	0,987
Maintaining error-free records	110	5,700	1,080
Convenient business hours	109	5,596	1,123
Employees who deal with customers in caring fashion	109	5,532	1,014
Employees who are consistently courteous	108	5,519	1,180
Making customers feel safe in their transactions	110	5,518	1,131
Modern equipment (e.g. trucks, SAP)	110	5,382	1,278
Employees who instill confidence in customers	109	5,303	1,198
Sales persons who have a neat, professional appearance	110	5,118	1,202
Visually appealing materials associated with service	110	5,045	1,259
Visually appealing offices	108	4,611	1,433

Overall average rating	**5,768**

TABLE 8: DESIRED RATING PER SERVQUAL ITEM

Items rated the highest in desired were linked to ‘Providing customer service at the promised time’, ‘Providing customer service as promised’, ‘Dependability in handling customers' service problems’, ‘Employees who have the knowledge to answer customer questions’, as well as ‘Performing customer service right the first time’. The ranking of the desired rating is similar to the perceived as well as desired ranking. 4 out of the 5 desired and perceived items are equal, with the exception of ‘Dependability in handling customers' service problems’ (desired) and ‘Employees who are consistently courteous’ (perceived).

The number of valid responses ranged from 108 to 110. The values for the standard deviation are in line with that of other researchers and are discussed in depth in Chapter 4.3. However, the standard deviation for the office items is the highest with 1.433. Additionally, the mean of this item has the biggest gap (0,434) to the next lowest item ‘Visually appealing materials associated with service’. This might be explained by the same reason as above – the market setting of the European nylon intermediates industry. Although invitations to visit Lanxess’ or the suppliers’ offices are often given, not all customers choose to follow them. Therefore, these customers might have concluded that since the business relation is running without having seen Lanxess location, there is no immediate need to pay a visit. Consequently, these customers might have given a very low rating (53 participants rated the desired performance on the 7-point Likert scale between 1 and 4).

4.2.4 Minimum Ratings

The minimum ratings of the SERVQUAL items are shown in descending order in Table 9. Minimum ratings are clearly lower than desired as well as performance

ratings. Overall average minimum rating is 4.284, with means of individual items ranging from a high mean of 5.173 for 'Providing customer service at the promised time' to a low mean of 2.853 for 'Visually appealing offices'.

	N	Mean	Std. Deviation
Providing customer service at the promised time	110	5,173	1,116
Dependability in handling customers' service problems	110	5,145	1,012
Providing customer service as promised	110	4,973	0,981
Performing customer service right the first time	110	4,845	1,151
Knowledgeble employees	110	4,809	1,036
Ability to respond to customer's request	110	4,727	0,966
Willingness to help customers	110	4,645	1,289
Prompt customer service	110	4,591	1,069
Employees who understand the needs of their customers	110	4,591	1,086
Giving customers individual attention	110	4,364	1,232
Keeping customers informed	110	4,309	1,123
Maintaining error-free records	110	4,236	1,285
Having the customer's best interests at heart	110	4,173	1,240
who are consistently courteous	108	4,120	1,464
Making customers feel safe in their transactions	110	4,018	1,320
Employees who deal with customers in caring fashion	108	4,009	1,301
Convenient business hours	108	3,963	1,175
Modern equipment (e.g. trucks, SAP)	110	3,918	1,389
Employees who instill confidence in customers	109	3,917	1,285
Visually appealing materials associated with service	110	3,527	1,386
Sales persons who have a neat, professional appearance	110	3,336	1,396
Visually appealing offices	109	2,853	1,380

Overall average rating	**4,284**

TABLE 9: MINIMUM RATING PER SERVQUAL ITEM

Items appraised the highest minimum were related to 'Providing customer service at the promised time', 'Dependability in handling customers' service problems', 'Providing customer service as promised', 'Performing customer service right the first time', as well as 'Employees who have the knowledge to answer customer

questions'. The ranking of the desired rating and the perceived rating show some major similarities. The items with the 5 highest means are the same for desired as well as for the minimum rating. Additionally, 4 of the 5 minimum and perceived items are equal, with the exceptions of 'Dependability in handling customers' service problems' (minimum) and 'Employees who are consistently courteous' (perceived). Furthermore, the 5 items with the lowest mean rating are the same for desired as well as minimum rating, consisting of 'Modern equipment', 'Employees who instil confidence in customers', 'Visually appealing materials associated with service', 'Sales persons who have a neat, professional appearance', as well as 'Visually appealing offices'.

The number of valid responses ranges from 108 to 110. The values for the minimum SERVQUAL items also exhibited a higher standard deviation than expectation and perception ratings.

4.2.5 Perception of Lanxess' customer service

This chapter showed a data analysis that revealed for the first-time how its customers perceive Lanxess' customer service. Additionally, a quantification of the findings was discussed.

Different ways of understanding customers' perception of Lanxess customer service quality were highlighted. Firstly, a SERVQUAL independent measure was elaborated on. It could be shown that the Lanxess customers' perception of service quality is regarded on average as 5.83 out of a scale from 1 to 7. Additionally, differences in terms of the participants' background were detailed and discussed. It

was shown that customers from medium to small companies regard the service offering of Lanxess higher than those of bigger companies. Similarly, customers with long-term business relations to Lanxess regard the service offering higher than customers with a shorter duration of business relation.

Next the rankings of the SERVQUAL items rating were illustrated and analysed. The descending sequence of the three SERVQUAL rankings - perceived, desired, and minimum - showed that from the five highest rated items four were identical for all three rankings. Additionally, the five lowest valued items were the same for the desired and minimum ranking. Therefore, the sequence of items rating was similar for all three rankings.

Next the overall average score for the perceived customer service quality was computed to be 5.735. Similarly, the means for desired and minimum rankings were developed and calculated with 5.768 and 4.284 respectively. It was shown that customers' perception of Lanxess' customer service quality and the desired service quality are almost matching on an overall scale.

However, a detailed item comparison revealed that even though the items' sequence does not vary tremendously, the actual items' mean value is. Figure 17 illustrates the mean ranges per item per ranking.

FIGURE 17: TOTAL SERVQUAL BATTERY

Figure 17 shows all 22-items of the SERVQUAL battery in descending order based on the participants' desired mean rating. Furthermore, the average minimum rating per item is also illustrated and connected to the desired value (line). The green dots show how Lanxess' customers perceive Lanxess' customer service per item.

The figure demonstrates that the customers' desired level of service quality - for the first seven items - is substantially higher than the perceived customer service quality from Lanxess. However, the graphic also illustrates that Lanxess' customer service quality for all items is regarded higher than the minimum service quality required. Rather interestingly the figure shows that a range of SERVQUAL items with slightly lower desired levels of service quality are significantly outperformed by Lanxess' customer service. This indicates that the perceived customer service level is higher than actually desired. This observation can be made for 8 items.

The next step is to evaluate the service dimensions and to analyse which service dimension of the customer service process is considered to be of high or low importance for the customers.

4.3 Evaluation of Service Dimension Importance

One of the research objectives is to evaluate the service dimensions and to assess which service dimension of the customer service process is considered to be of high or low importance for the customers. In order to analyse the data according to the SERVQUAL dimensions as suggested by Parasuraman, Zeithaml and Berry (1994) the reliability of the tool structure needs to be proven.

Reliability is an assessment of the degree of consistency between multiple measurements of a variable. One commonly used form of measure of reliability is internal consistency which applies to the consistency among the variables in a summated scale (Hair et al., 2006). This concept proven by Churchill (1979) says that the individual items or indicators of the scale should all measure the same construct and thus be highly intercorrelated. The diagnostic measure is the reliability coefficient that assesses the consistency of the entire scale, with Cronbach's alpha being the most widely used measure (Cronbach, 1951, Peter, 1979).

Hence, to test the reliability of the SERVQUAL instrument in the European nylon intermediate industry, the Cronbach coefficients were computed (see Table 10). The results of this test produced an α-score, which is a number between 0 and 1.

According to Garson (2002), the higher the α-score is the more reliable the measured construct. Furthermore, Nunnally and Bernstein as well as Hair et al. (2006) suggest that an α-score exceeding 0.7 indicates high internal reliability of the scale items, while to the contrary there are still researchers who use different cut-off α-scores like 0.8 or even 0.6 (Garson 2002).

The Cronbach alpha is, as also demonstrated in Chapter 3.7.1, a commonly used measure to test the reliability of a group of items that measure a factor (Large and König, 2009). In this chapter reliability coefficients (alphas) are computed and presented for each dimension of the SERVQUAL scale as suggested by Parasuraman et al. (1994).

A more detailed analysis of the tool's reliability, as suggested by Babakus and Mangold (1992), with corrected item-to-total correlations as well as individual scores for each item and summated scores of the rest of the items is described in Chapter 4.4. In this chapter, an answer to research objective 3 is also provided.

Service quality scores with SERVQUAL are usually calculated for each dimension by summing respondent ratings for each item within the dimension and dividing the sum by the number of items in the dimension. Service quality was calculated in this manner for each dimension using performance-only scores and difference scores based on performance minus expectations and performance minus minimum. Additionally, in order to later assess which service dimension is of higher respectively lower importance for the customers the minimum scores were also analysed. However, before using the SERVQUAL dimensions the Cronbach's alpha reliability analysis was performed.

Cronbach's Alpha	Perceived	MSS	MSA	Minimum
Reliability	0,843	0,821	0,732	0,806
Responsiveness	0,789	0,691	0,727	0,813
Assurance	0,805	0,662	0,702	0,863
Empathy	0,830	0,758	0,798	0,863
Tangibles	0,786	0,791	0,806	0,863
Overall	0,937	0,910	0,908	0,949

TABLE 10: CRONBACH'S ALPHA

In general, the computed Cronbach's alphas demonstrate a high reliability of SERVQUAL's dimensions (see Table 10). The reliability analysis of the perceived scores gives Cronbach's Alphas of at least 0,786 per dimension. The overall scale's reliability is 0,937. Similarly, all Cronbach's alpha values for the minimum scores exceed a 0,800 alpha value.

The alpha values for the MSA scores exceed the recommended alpha value of 0,700. The reliability tests for the MSS scores only confirm relatively modest support for the responsiveness and assurance dimensions with alpha values of 0,691 and 0,662. The reliability coefficients ranged from the low of 0,662 for the assurance score to the high of 0,821 for the reliability score. These results are comparable to alpha scores reported by Babakus and Boller (1991) of 0,67 to 0,83 and by Brensinger and Lambert (1990) of 0,64 to 0,88.

It can be summarised that for all perceived and minimum scores as well as gap scores, the reliability estimates of the five-factor model were generally good with the one exception of the assurance and responsiveness dimension at the MSS gap score whose reliability estimates are only modest. Nevertheless, the conducted reliability

analysis provides support for the five-factor SERVQUAL model and the SERVQUAL battery can be analysed along the five-dimensional structure.

4.3.1 Perceived Service

The analysis of the perceived scores per dimension, as shown in Table 11, suggests that the quality of the perception of SERVQUAL's dimensions vary. The mean scores per dimension in descending order range from reliability (5,866), responsiveness (5,760), tangibles (5,708), and empathy (5,684) to assurance (5,685). The standard deviation ranges from 0,771 for reliability to 0,806 for assurance.

	ReliabilityL	ResponsivenessL	AssuranceL	EmpathyL	TangiblesL
Mean	5,866	5,760	5,685	5,684	5,708
Std. Error of Mean	0,074	0,074	0,077	0,075	0,072
Median	6,000	6,000	5,750	5,800	5,750
Std. Deviation	0,771	0,777	0,806	0,788	0,753
Cronbach's Alpha	0,843	0,789	0,805	0,830	0,786

TABLE 11: PERCEIVED - DIMENSION SCORES

4.3.2 Measure of Service Superiority

Next, the European nylon intermediates customers' perceived level of service quality of Lanxess is compared to their zones of tolerance for each dimension. The zone of tolerance is defined by Parasuraman et al. (1993, 146) as *the space between adequate service and desired service*. Here, Parasuraman et al. (1993, 146) continue, *managers can see where customers' perceptions fall relative to the zone of tolerance for*

individual service quality items and dimensions […]. Hence, the range of tolerance has two boundaries; the lower boundary is the minimum or adequate level that the nylon intermediates customers find acceptable, and the upper boundary is the desired level of service quality that customers would like to have. The customers' perception of the actual service quality level is compared to this zone of tolerance to establish whether the quality of service provided is fitting into the customers' zone of tolerance.

	ReliabilityLD	ResponsivenessLD	AssuranceLD	EmpathyLD	TangiblesLD
Mean	-0,396	-0,245	0,008	-0,084	0,655
Std. Error of Mean	0,076	0,067	0,065	0,070	0,093
Median	-0,400	-0,250	0,000	0,000	0,500
Std. Deviation	0,799	0,703	0,680	0,729	0,977
Cronbach's Alpha	0,821	0,691	0,662	0,758	0,791

TABLE 12: MSS - DIMENSION SCORES

The MSS, or, Measure of Service Superiority is the difference between the perceived service quality rating and the desired service quality rating, which is calculated for each of the five dimensions. A negative MSS value implies that the OSQ rating for what the European nylon intermediates customers perceive the level of service quality to be, is less than the customers' desired service quality level for that dimension. A positive MSS value means that the OSQ rating that the customers perceive the service quality to be is greater than their desired service quality level for that dimension. A value of zero means that the OSQ rating is equivalent to the customers' desired service level for that dimension.

The data was analysed to determine whether there are any differences in perception of actual service levels relative to desired service (by respective dimensions). The

analysis suggests that the negative MSS value for reliability and responsiveness means that the OSQ rating is less than the customers' desired service quality level for these dimensions. Furthermore, a negative MSS was also computed for the empathy dimension, yet with a smaller gap of only 0,084. A positive MSS value observation can be made for the SERVQUAL dimension tangibles. The gap of 0,655 is the largest of all 5 dimensions. A value of zero was obtained for the dimension of assurance which exhibited a mean gap of close to zero (median = 0,000). This suggests that the customer service of Lanxess is exactly meeting the desired service level for the assurance dimension.

Generally, it can be stated that the analysis of the Measures of Service Superiority suggests that the customer service of Lanxess is in three dimensions, namely tangibles, assurance, and empathy above or close to the desired level of service quality. With respect to potential areas of improvement, the European nylon intermediates customers desire enhanced service quality for the dimensions reliability and responsiveness.

This leads to the question whether the service quality delivered by Lanxess is in all dimensional aspects rightly performed. The data suggests that Lanxess customer service is partly perceived better than desired and thus positively surpasses the zone of tolerance as suggested by Parasuraman et al. (1993). Questions arise if this observation might be transformed into an advantage and whether Lanxess could build on the outperformance gap score in the tangibles dimension.

In order to understand if the other service quality dimensions are within the zone of tolerance the Measures of Service Adequacy was examined.

4.3.3 Measure of Service Adequacy

The MSA, or, Measure of Service Adequacy, is the difference between the perceived service quality rating and the adequate (or minimum) service quality rating, which is calculated for each of the five dimensions. A positive MSA value means that the European nylon intermediates customer perceives the service quality level to be greater than their minimum service quality level for that dimension. A negative MSA value means that the OSQ rating for what the customers perceive the level of service quality to be, is less than the customers' minimum service quality level for that dimension. A value of zero means that the OSQ rating is equivalent to the customers' adequate service level of that dimension.

	ReliabilityLM	ResponsivenessLM	AssuranceLM	EmpathyLM	TangiblesLM
Mean	0,972	1,188	1,461	1,458	2,288
Std. Error of Mean	0,070	0,077	0,075	0,077	0,111
Median	1,000	1,125	1,500	1,400	2,417
Std. Deviation	0,737	0,805	0,789	0,803	1,164
Cronbach's Alpha	0,732	0,727	0,702	0,798	0,806

TABLE 13: MSA - DIMENSION SCORES

The data was analysed to determine whether there are any differences in perception of actual service levels relative to minimum service, by respective dimensions. The analysis suggests that Lanxess' customer service by far outperforms the minimum level of service in all dimensions; the descending ranking of the service quality dimensions gives slightly more insight into the respective gap scores: tangibles (2,288), assurance (1,461), empathy (1,458), responsiveness (1,188) and reliability (0,972).

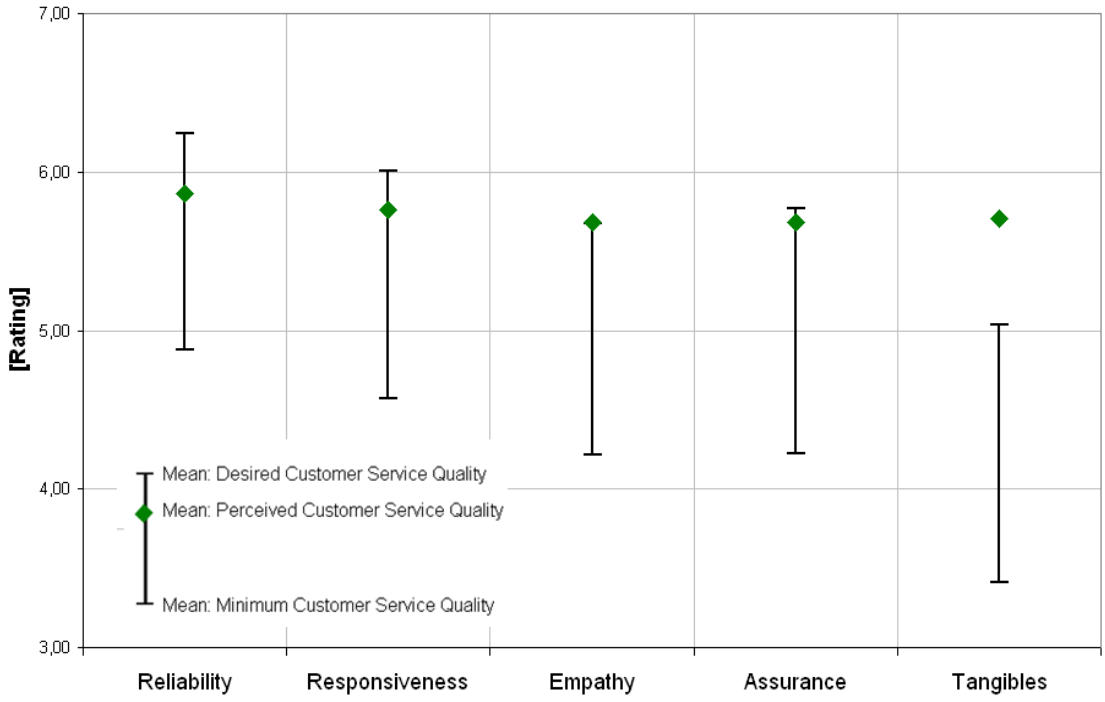


FIGURE 18: SERVQUAL BATTERY PER DIMENSION

Figure 18 shows all 5-dimensions of the SERVQUAL battery in descending order based on the participants' desired mean rating. Furthermore, the average minimum rating per dimension is also illustrated and connected to the desired value (line). The green dots illustrate how Lanxess' customers perceive Lanxess' customer service per dimension.

The figure demonstrates that the customers' desired level of service quality for the dimensions reliability and responsiveness is substantially higher than the perceived customer service quality from Lanxess. However, the graphic also illustrates that Lanxess' customer service quality for the other dimensions is higher than the minimum service quality required. As discussed earlier, the figure illustrates that the perceived customer service of Lanxess is in-line with the desired service quality for the dimensions empathy as well as assurance. Interestingly, the figure shows that one SERVQUAL dimension – tangibles – is recognized significantly better than desired.

Here, Lanxess' customer service significantly outperforms the desired service quality of that dimension.

The analysis also suggests that the ranking of the minimum as well as the desired service dimension is equal. The highest rated dimension is reliability, followed by responsiveness, empathy, and assurance down to the dimension tangibles for both desired and minimum service levels. Interestingly, the perceived quality ranking of Lanxess' customer service level is different. The two highest rated dimensions are also the highest rated dimensions for the perceived scores: reliability and responsiveness. However, the lowest rated dimension of the desired and perceived scores, tangibles, is rated number three for the perceived scores followed by assurance and empathy.

4.3.4 Measure of Service Importance

At the beginning of this chapter one of the research objectives was completed by evaluating the service dimensions of the SERVQUAL battery. Next, the chapter assessed which service dimension of the customer service process is considered to be of high or respectively low importance for the customers. This evaluation was conducted by analysing the minimum expectation ratings of the European nylon intermediates customers.

	ReliabilityM	ResponsivenessM	AssuranceM	EmpathyM	TangiblesM
Mean	4,875	4,568	4,214	4,226	3,412
Std. Error of Mean	0,080	0,085	0,103	0,093	0,111
Median	4,800	4,500	4,250	4,200	3,250
Std. Deviation	0,836	0,895	1,076	0,974	1,168
Cronbach's Alpha	0,806	0,813	0,863	0,863	0,863

TABLE 14: MINIMUM - DIMENSION SCORES

Table 14 reveals the significant differences of the minimum scores per dimension. The reliability dimension is rated highest with a mean of 4,875. The second most important dimension is responsiveness (4,568), followed by empathy (4,226) and assurance (4,214). However, the dimension tangibles is only rated with a minimum expectation of 3,412. The standard deviation widely ranges form 0,836 for the reliability dimension to 1,168 for the tangibles dimension. The minimum scores are sometimes referred to as the importance score of the customers (Zeithaml et al., 1993).

This shows that the reliability dimension is regarded as the most important service quality dimension within the European nylon intermediates industry. This appears reasonable since the industry is often highly dependent on just-in-time deliveries and *driving warehouses* where a truck delivering nylon intermediates to the customer is referred to as a "*driving warehouse*". The concept is that a truck may provide up to 50% additional warehouse capacity for small to medium customers. One customer for example might only have a 50mt warehouse and orders a truckload of 27mt caprolactam. Such a delivery by truck would be called a "*driving warehouse*". Since the customer service process is a key element of this supply chain process, customers exhibit a high interest in the customer service dimension reliability. Not only this example explains the high importance ranking of the reliability dimension, but also

the high number of product deliveries supports this finding. A medium to large sized company might order between 500 to 1,000mt of product per month which usually translates into one order split into daily deliveries during the respective month. Customers want to be assured that each delivery arrives at the desired time, is billed correctly, and is delivered according to contract. Therefore, the high importance across all ratings and rankings seems understandable.

Interestingly, the second most important dimension for the European nylon intermediates customers is responsiveness. However, after analysing the dimensions' items composition, this high importance rating is also confirmed by business experience. As the production of nylon intermediates is based on highly sophisticated processes and depends on a variety of factors, production outages and force majeure declarations might occur. Generally, customers are aware of this fact. Hence, responsiveness is critical as an early, prompt and detailed warning of production issues is vital to allow customers sufficient time to react. Furthermore, production problems might also occur on the customers' side and it is crucial that the customer service is willing to respond promptly and immediately to adjust the value chain accordingly. The same applies to unexpectedly increased or decreased customers' demand. In this case the customer appreciates a high responsiveness of the customer service in order to be able to adjust its production and procurement accordingly.

The importance of the dimensions assurance as well as empathy is almost equally rated. Assurance as discussed earlier refers to the knowledge and courtesy of employees and their ability to inspire trust and confidence (Parasuraman et al., 1988). Assurance, Dagger and Lawley (2002) state, is particularly important in services that rate high in perceived risk and customer involvement. As described in Chapter 4.1

the frequency of interaction between customers and Lanxess highly varies. Even though seven per cent of customers have daily contact, the huge majority of customers state that the contact to Lanxess is limited to weekly, monthly or even quarterly contacts. Additionally, the perceived personal risk is also assumed to be limited, since a business-to-business transaction occurs and at minimum four out of five respondents are not held financially responsible for the success of the whole company (see Table 4). Therefore, a relative low importance rating of 4.214 seems reasonable, which is similarly the case for the empathy dimension.

Empathy is demonstrated by giving caring, individualised attention to customers (Parasuraman et al., 1988). Hence, empathy can be explained as providing individual attention to customers given by the service provider as well as the understanding and caring for the customer. In the European nylon intermediates industry which is characterized by its oligopolistic market structure with only few sellers and a limited number of large-sized buyers, customers and buyers know each other. Even though individualised contacts between customers and buyers occur, whenever manageable, neither personal relation nor personal attention is the main focus. In the European nylon intermediates industry focus is placed on easy access to the customer service of the supplier which explains the desire for convenient business hours. A caring fashion or interest in individual needs of the business contact is also not in prime focus. Therefore, the rather low importance rating for empathy can be derived which is further supported by business observations.

Most revealing is the very low importance rating for the dimension of tangibles with a mean importance rating of only 3,412. Tangibles are defined by Parasurman et al. (1998) as the physical facilities, equipment and the appearance of staff. A key

example for this dimension is the appropriateness of an airline's airplane, ticketing information, check-in counters, arrival and departure lounges (Zeithaml and Bitner, 1996). Technically, tangibles create a physical presence that affects customers' sensory perceptions. Customers often have to use physical evidence to analyse the quality of service. Tangible cues, Dagger and Lawley (2000) summarise, are readily available to consumers in most service settings and can make an intangible service appear more tangible. Thus in business to consumer markets tangible elements in the service delivering process act as indicators of quality and are often used in conjunction with other dimensions to create the overall quality perception of an organisation.

Since the thesis setting is based in a highly tangible business-to-business market environment, several adjustments were made to the tangibles' items. In the context of the thesis, item 19 was enriched by giving an example of what is meant by 'modern equipment' – with trucks and IT systems (SAP, Siebel) mentioned as examples. Next item 20 was changed to account for the thesis' setting. The word *office* was seen to include not only the individual offices but also the company's general premises such as e.g. the foyer. Therefore, the word *facilities* was replaced by *offices*. Item 21 was also rephrased to adjust to the business environment of the European nylon intermediates market. Item 22 was clarified by giving explanatory examples.

However, the low outcome of the mean importance rating for the tangibles dimension remains remarkable. Based on an intense analysis of the individual items and the dimension, three reasons seem likely to explain the phenomenon. In the final chapter the consequences of this observation for the customer service offerings for Lanxess are discussed.

First, since the European nylon intermediates business environment is highly tangible and highly transaction oriented the physical presence that affects customers' sensory perceptions is only of minor importance. Other dimensions such as reliability and responsiveness are regarded as much more critical. Therefore, the importance of the tangibles dimension is only limited.

A customer of Lanxess shows higher interest in a smooth customer service process than in a neat appearance of the sales force or a formidable office. Focus is placed on content and reliability. More than 50 per cent of respondents (47.3% + 10.9%) are solely driven by content and are mainly fact based. For them it is essential that the chemical composition of the nylon intermediate is accurate and hence, the appearance of the supplier's offices plays an inferior role. The same line of thinking as for offices also applies to the importance rating for trucks. It is much more vital for the customer to receive a truck delivery at the promised time, or at least be informed about changes in the delivery schedule, than receiving the delivery in a particularly modern truck. As long as a delivery is fulfilled according to specifications, the physical means for delivery are not pivotal.

These measurements offer Lanxess several opportunities to enhance its position. Firstly, Lanxess might draw the conclusion that its tangibles offering may generally exceed the required minimum demand. This would offer the opportunity to consider slightly lowering Lanxess' standards regarding trucks and the appearance (e.g. replace trucks less frequently). While this would reduce costs and enhance the profitability of the operation it should be carefully evaluated whether the savings justify lowering general standards.

However another conclusion could be to benefit from this measured difference if Lanxess manages to increase the relevance of tangibles and reliability in the customers' perception. In a first step, Lanxess could promote the general relevance and benefits of reliability and / or tangible items in the nylon intermediates industry to then in a second step create awareness of the significant better service offering provided by Lanxess. This could lead to a differentiating factor in the market.

Second, as discussed before some items of the tangibles dimension produced a low response rate when respondents were asked how they perceive Lanxess' service quality – the number of only 100 valid responses out of 115 responses for 'Visually appealing offices' being the minimum.

This observation is explained by the market setting of the European nylon intermediates industry. Although it is a high priority to invite customers to the supplier's respectively Lanxess' location, not all business contacts choose to visit Lanxess' offices. Therefore, a lower response for the perceived Lanxess rating was regarded as reasonable since for the investigated business-to-business customer service a face-to-face contact at the suppliers' site is not necessarily a prerequisite for conducting business.

Interestingly, even though 17 answers were missing when respondents were asked for the perceived rating of Lanxess' service at the tangibles dimension, only two answers were missing when the minimum service quality level for the same dimension was asked for. Therefore, it can be assumed that people who have not rated the perceived score gave a relatively low importance rating for the dimension and thus had an influence on the overall low mean rating.

Third, the reason for the low mean rating of tangibles might be explained by Lovelock's (1994) "flower of service" concept where he depicts a seller's total offering to a customer as an eight-petaled flower whose centre represents the sellers' basic product (good), while its petals represent key elements of how the seller serves the customer. This thesis links customer service more to the petals of Lovelock's (1994) flower than to its centre. Therefore, the respondents might have balanced the ranking for the tangible dimensions of customer service versus the core product. This would mean that the right specification of the core offering is met, and hence the petal *tangibles* would be regarded as less critical.

This chapter evaluated service dimensions and assessed which service dimension of the customer service process is considered to be of high or low importance for the customers. In order to analyse the data according to the SERVQUAL dimensions as suggested by Parasuraman, Zeithaml and Berry (1994) the reliability of the tool structure was demonstrated. Reliability was assessed by using the concept proven by Churchill (1979).

It could be validated that for all perceived and minimum scores as well as for gap scores, the reliability estimates of the five-factor model were generally good. They provide strong support for the five-factor SERVQUAL model. Service quality was subsequently calculated in this manner for each dimension using performance-only scores and difference scores based on performance minus expectations and performance minus minimum. Additionally, in order to later assess which service

dimension is of higher respectively lower importance for the customers, the minimum scores were also analysed.

The analysis showed that customer service quality for the reliability dimension is rated highest for perceived and MSS scores. The analysis also demonstrated that one SERVQUAL dimension – tangibles – is perceived significantly better than desired. To that respect, the Lanxess customer service significantly outperforms the desired service quality of that dimension and questions were raised and answered if and how to take advantage of this observation.

Finally, the importance of the service dimensions was assessed. The investigation showed that the reliability dimension is regarded as the most important service dimension. However most remarkable was the low importance rating of the tangibles dimension. Here the question was addressed what the reason for the low scoring could be and finally consequence for the service offering of Lanxess were alluded to.

4.4 Validate Model of Quality Satisfaction: Reliability Test

In order to answer the research objectives 3 and 4 and to extend the use of theory to a specific application and thus contributing not only to the practice of management but also to the application of theory, the thesis aims to validate a slightly adapted SERVQUAL instrument for the nylon intermediates industry and to assess the usefulness and adaptability of SERVQUAL as a tool in a low involvement, highly transaction oriented business-to-business market. In order to confirm the slightly

adapted SERVQUAL as valid instrument for measuring service quality in the industry sector the model's reliability and validity needs to be tested. In this chapter the reliability of the model is assessed in detail and certain validity checks are performed.

The Cronbach Alpha is, as demonstrated in Chapter 4.3, a commonly used measure to test the reliability of a group of items that measure a factor (Large and König, 2009). In this chapter reliability coefficients (alphas) are therefore computed and presented for each dimension of the SERVQUAL scale as suggested by Parasuraman et al. (1994). This is also done to assess the internal consistency of the a priori grouping of the 22 items into the five dimensions.

Hair et al. postulate (2010, 92), *Cronbach's alpha is a measure of reliability that ranges from 0 to 1, with values of .60 to .70 deemed the lower limit of acceptability*. Items for each dimension (e.g., tangibles) were subject to this reliability assessment. Additionally, as suggested by Babakus and Mangold (1992), corrected item-to-total correlations were also examined; the scores for an item and the summated scores of the rest of the items comprising a subscale (e.g., the subscale measuring the assurance dimension of service quality) were correlated. These analyses were conducted for the desired and perceived measures, as well as for the computed gap measures of MSA and MSS. Further convergent validity of SERVQUAL was checked by measuring the extent to which each item correlated with items in the same factor or dimension.

(n=110)	Item-to-Total Correlations	Item Means	Standard Deviation
Reliablity (α = 0,732)			
Providing customer service as promised	0,570	6,373	0,788
Dependability in handling customers' service problems	0,495	6,364	0,798
Performing customer service right the first time	0,615	6,318	0,765
Providing customer service at the promised time	0,618	6,464	0,786
Maintaining error-free records	0,279	5,700	1,080
Responsiveness (α = 0,719)			
Keeping customers informed	0,434	5,827	0,966
Prompt customer service	0,627	6,027	1,018
Willingness to help customers	0,463	5,991	0,991
Ability to respond to customer's request	0,526	6,164	0,784
Assurance (α = 0,77)			
Employees who instill confidence in customers	0,656	5,303	1,198
Making customers feel safe in their transactions	0,669	5,518	1,131
Employees who are consistently courteous	0,632	5,519	1,180
Knowledgeble employees	0,357	6,345	0,747
Empathy (α = 0,741)			
Giving customers individual attention	0,563	5,909	0,944
Employees who deal with customers in caring fashion	0,583	5,532	1,014
Having the customer's best interests at heart	0,630	5,718	0,987
Employees who understand the needs of their customers	0,384	6,064	0,805
Convenient business hours	0,387	5,596	1,123
Tangibles (α = 0,836)			
Modern equipment (e.g. trucks, SAP)	0,612	5,382	1,278
Visually appealing offices	0,717	4,611	1,433
Sales persons who have a neat, professional appearance	0,734	5,118	1,202
Visually appealing materials associated with service	0,616	5,045	1,259
Overall Scale (α = 0,924)			

Table 15: Précis of desired scores

The analyses of coefficient alpha values for the desired subscale are 0.732, 0.719, 0.770, 0.741, and 0.836, for reliability, responsiveness, assurance, empathy, and tangibles, respectively. Of the individual expectation items, only one has a correlation with the total scores lower than the .35 cut-off value suggested by Saxe and Weitz (1982). This item, “Maintaining error-free records”, has a correlation of 0.279 with the total scores. The rest of the item-to-total correlations for the desired scale varies from 0.357 to 0.734. Reliabilities for linear combinations of the five

subscales were also computed to assess the overall internal consistency of the measure (Nunnally, 1978). The coefficient alpha for the overall scale as a linear combination of subscale is 0.924. The standard deviations are in line with those of other researchers (e.g. Babakus and Mangold, 1992). The detailed analysis can be found in Table 6.

	Item-to-Total Correlations	Item Means	Standard Deviation
Reliablilty (α = 0,843)			
Providing customer service as promised	0,761	5,936	0,955
Dependability in handling customers' service problems	0,700	5,855	0,907
Performing customer service right the first time	0,671	5,891	0,989
Providing customer service at the promised time	0,681	5,955	1,087
Maintaining error-free records	0,453	5,657	0,959
Responsiveness (α = 0,789)			
Keeping customers informed	0,584	5,633	1,006
Prompt customer service	0,686	5,836	1,080
Willingness to help customers	0,649	5,818	1,042
Ability to respond to customer's request	0,481	5,745	0,829
Assurance (α = 0,805)			
Employees who instill confidence in customers	0,662	5,411	1,107
Making customers feel safe in their transactions	0,748	5,422	1,091
Employees who are consistently courteous	0,555	5,926	1,039
Knowledgeble employees	0,543	5,945	0,792
Empathy (α = 0,830)			
Giving customers individual attention	0,658	5,864	1,161
Employees who deal with customers in caring fashion	0,728	5,583	1,095
Having the customer's best interests at heart	0,670	5,542	0,984
Employees who understand the needs of their customers	0,622	5,555	0,954
Convenient business hours	0,474	5,862	0,907
Tangibles (α = 0,786)			
Modern equipment (e.g. trucks, SAP)	0,679	5,764	0,911
Visually appealing offices	0,516	5,510	0,916
Sales persons who have a neat, professional appearance	0,650	5,811	0,937
Visually appealing materials associated with service	0,548	5,651	1,100
Overall Scale (α = 0,937)			

Table 16: Précis of perceived scores

The coefficient alpha values for the perceived subscale scores are 0.843, 0.789, 0.805, 0.830, and 0.786, for reliability, responsiveness, assurance, empathy, and tangibles, respectively. Of the individual expectation items, none has a correlation

with the total scores lower than the suggested 0.35 cut-off value. The value of the item-to-total correlations for the perceived scale extends from 0.453 to 0.761. Reliabilities for linear combinations of the five subscales were also obtained to determine the overall internal consistency of the measure. The coefficient alpha for the overall scale as a linear combination of subscale was found to be 0.937.

	Item-to-Total Correlations	Item Means	Standard Deviation
Reliablilty (α = 0,821)			
Providing customer service as promised	0,699	-0,442	0,846
Dependability in handling customers' service problems	0,657	-0,529	1,014
Performing customer service right the first time	0,600	-0,452	0,923
Providing customer service at the promised time	0,715	-0,529	1,173
Maintaining error-free records	0,479	-0,106	1,269
Responsiveness (α = 0,691)			
Keeping customers informed	0,524	-0,202	1,095
Prompt customer service	0,569	-0,184	1,010
Willingness to help customers	0,416	-0,184	0,992
Ability to respond to customer's request	0,405	-0,422	0,797
Assurance (α = 0,662)			
Employees who instill confidence in customers	0,428	0,485	1,061
Making customers feel safe in their transactions	0,584	-0,971	0,924
Employees who are consistently courteous	0,406	0,379	0,991
Knowledgeble employees	0,370	-0,427	0,870
Empathy (α = 0,758)			
Giving customers individual attention	0,553	-0,667	1,031
Employees who deal with customers in caring fashion	0,434	0,038	0,990
Having the customer's best interests at heart	0,630	-0,200	0,924
Employees who understand the needs of their customers	0,540	-0,533	0,951
Convenient business hours	0,491	0,276	1,156
Tangibles (α = 0,791)			
Modern equipment (e.g. trucks, SAP)	0,627	0,365	1,125
Visually appealing offices	0,572	0,896	1,294
Sales persons who have a neat, professional appearance	0,656	0,604	1,110
Visually appealing materials associated with service	0,563	0,479	1,256
Overall Scale (α = 0,91)			

Table 17: Précis of MSS scores

The coefficient alpha values for the MSS subscale scores are 0.821, 0.691, 0.662, 0.758, and 0.791, for reliability, responsiveness, assurance, empathy, and tangibles, respectively. Of the individual expectation items, none has a correlation with the

total scores lower than the suggested 0.35 cut-off value. The value of the item-to-total correlations for the perceived scale ranges from 0.370 to 0.715. Reliabilities for linear combinations of the five subscales were also calculated to measure the overall internal consistency of the measure. The coefficient alpha for the overall scale as a linear combination of subscale is 0.910.

	Item-to-Total Correlation	Item Means	Standard Deviation
Reliablilty (α = 0,732)			
Providing customer service as promised	0,530	0,933	0,906
Dependability in handling customers' service problems	0,545	0,692	1,034
Performing customer service right the first time	0,457	1,029	0,919
Providing customer service at the promised time	0,587	0,760	1,110
Maintaining error-free records	0,393	1,365	1,288
Responsiveness (α = 0,727)			
Keeping customers informed	0,549	1,312	1,192
Prompt customer service	0,618	1,248	1,047
Willingness to help customers	0,569	1,156	1,189
Ability to respond to customer's request	0,346	1,018	0,902
Assurance (α = 0,702)			
Employees who instill confidence in customers	0,481	1,398	1,032
Making customers feel safe in their transactions	0,603	1,359	0,959
Employees who are consistently courteous	0,434	1,767	1,206
Knowledgeble employees	0,459	1,097	0,965
Empathy (α = 0,798)			
Giving customers individual attention	0,645	1,495	1,171
Employees who deal with customers in caring fashion	0,543	1,563	1,016
Having the customer's best interests at heart	0,717	1,398	1,079
Employees who understand the needs of their customers	0,567	0,961	1,009
Convenient business hours	0,444	1,961	1,111
Tangibles (α = 0,806)			
Modern equipment (e.g. trucks, SAP)	0,542	1,866	1,264
Visually appealing offices	0,681	2,691	1,503
Sales persons who have a neat, professional appearance	0,663	2,443	1,369
Visually appealing materials associated with service	0,607	2,072	1,516
Overall Scale (α = 0,908)			

Table 18: Précis of MSA scores

The coefficient alpha values for the MSA subscale scores are 0.732, 0.727, 0.702, 0.798, and 0.806, for reliability, responsiveness, assurance, empathy, and tangibles, respectively. Of the gap scores, only one has a correlation with the total scores lower

than the .35 cut-off value suggested by Saxe and Weitz (1982). The value of the rest item-to-total correlations for the perceived scale varies form 0.393 to 0.717. Reliabilities for linear combinations of the five subscales were also assessed to derive the overall internal consistency of the measure. The coefficient alpha for the overall scale as a linear combination of subscale is 0.908.

In summary, it can be stated that for all perceived and desired scores as well as gap scores, the reliability estimates of the five-factor model were generally good with the one exception of the assurance and responsiveness dimension at the MSS gap score whose reliability estimates are only modest. This observation fuels the ongoing discussion of SERVQUAL's difference-score conceptualization. As early as 1990 Parasuraman, Berry and Zeithaml (1993, 1994, 1994b) start to respond to critique concerning the gap model for example in response to Brown, Churchill and Peter (1993) and likely most prominent towards Cronin and Taylors' SERVPERF (1992). Chapter 3 referred to this discussion and the details at length.

The conducted reliability analysis provides support for the five-factor SERVQUAL model. In order to fully confirm the slightly adapted SERVQUAL as a valid instrument for measuring service quality in the European nylon intermediates industry the model's validity needs also to be proven. The next chapter assesses the validity of the model with the help of an in depth factor analysis.

4.5 Validate Model of Quality Satisfaction: Factor Analysis

Parasuraman, Zeithaml and Berry (1988) observe a clear five-dimensional factor in the original SERVQUAL study. This result derived from a comprehensive factor analysis of the 1988 data. Factor analysis is an interdependence technique, whose primary purpose is to define the underlying structure among the variables in the analysis. Hair et al. (2006) state that factor analysis provides the tools for analysing the structure of the interrelationships (correlations) among a large number of variables (e.g. the 22-items) by defining sets of variables that are highly intercorrelated, known as factors.

Since one of the objectives of this research is to assess and apply the SERVQUAL instrument in the new context of the European nylon intermediates industry the dimensionality and hence validity of the SERVQUAL instrument were assessed with the help of factor analysis. There are two main approaches to factor analysis that are described and discussed in detail in Chapter 3.6.2 – exploratory and confirmatory. Exploratory factor analysis is often used in research to gather information about (explore) the inter-relationships among a set of variables (Pallant, 2001). Confirmatory factor analysis on the other hand, is a more complex and sophisticated set of techniques used in research processes to test (confirm) specific hypotheses or theories concerning the structure underlying a set of variables (Pallant, 2001).

4.5.1 Exploratory Factor Analysis

In order to examine the dimensionality of the scale, each of the correlation matrixes (i.e. correlations of difference scores, expectations, and perceptions) is factor

analysed separately. As discussed previously, factor analysis involves a number of steps: assessment of the data, factor extraction and factor rotation. Next the procedures involved in the assessment of the data and the extraction of the factors will be presented and discussed for each data set. Finally, the additional procedures required to rotate and to interpret the factors will be covered.

The first step when performing a factor analysis is to assess the suitability of the data for factor analysis. As discussed in Chapter 3.6.2, this involves inspecting the correlation matrix for coefficients of 0,3 and above. The inspection of the correlation matrices for the two difference-scores as well as the desired and perceived data show several correlations above the required 0,3 level. Therefore, according to researchers (e.g. Tabachnick and Fidell, 1996), it can be concluded that the data sets are appropriate for factor analysis. The detailed correlation matrices can be found in Appendix B with all values above the threshold of 0,3 highlighted in bold figures. Next, in order to assess the factorability of the data, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity were performed.

	Desired	Perceived	MSS	MSA
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0,844	0,899	0,858	0,832
Bartlett's Test of Sphericity Sig.	0,000	0,000	0,000	0,000

TABLE 19: KMO AND BARTLETT´S TEST OF SPHERICITY

The analysis shows that the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) values are well above the threshold of 0,6. The analysis of the desired service level (E) gives a value of 0,844 (Approx. Chi-Square 1225,790); the value for the perceived service (P) is 0,899 (Approx. Chi-Square 11162,733); and the values for the measure of service superiority (Q) and for the measure of service adequacy are 0,858 and 0,832 respectively (Approx. Chi-Square 932,302 and 896,902). The Bartlett's Test of Sphericity value should be significant and the Sig value should be 0,05 or smaller. The analysis of the four data sets confirms that the Bartlett's test is significant at each analysed data set (see Table 19). Therefore, it can be concluded that factor analysis is appropriate.

To determine how many factors to extract, Chapter 3.6.2. clarified which analysis should be conducted. Using Kaiser's criterion, the components with an eigenvalue of 1 or greater are of interest. To determine how many components meet this criterion *the total variance explained* tables had to be developed and analysed. First, an unconstrained principal components factor analysis was realized on the desired scores.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8,203	37,286	37,286	8,203	37,286	37,286
2	2,351	10,688	47,974	2,351	10,688	47,974
3	1,704	7,747	55,722	1,704	7,747	55,722
4	1,185	5,389	61,110	1,185	5,389	61,110
5	1,091	4,960	66,070	1,091	4,960	66,070
6	,944	4,289	70,360			
7	,793	3,606	73,966			
8	,720	3,273	77,239			
9	,630	2,863	80,101			
10	,568	2,580	82,681			
11	,541	2,460	85,141			
12	,487	2,212	87,353			
13	,430	1,952	89,306			
14	,374	1,698	91,004			
15	,364	1,653	92,657			
16	,324	1,474	94,131			
17	,306	1,391	95,522			
18	,270	1,227	96,749			
19	,219	,994	97,743			
20	,196	,891	98,634			
21	,175	,794	99,428			
22	,126	,572	100,000			

Extraction Method: Principal Component Analysis.

TABLE 20: COMPONENTS EXTRACTED USING DESIRED SCORES (E)

The factor analysis highlighted 5 components with recorded eigenvalues of above 1 (8,203; 2,351; 1,704; 1,185; 1,091). These five components explain a total of 66,07 per cent of the variance (see Table 20).

The next analysis was performed on the perceived score (P). The factor analysis demonstrated that 4 components recorded eigenvalues of above 1 (9,717; 1,775; 1,273; 1,103). These four components account for a total of 63,041 per cent of the variance (see Table 21).

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9,717	44,170	44,170	9,717	44,170	44,170
2	1,775	8,070	52,241	1,775	8,070	52,241
3	1,273	5,788	58,028	1,273	5,788	58,028
4	1,103	5,012	63,041	1,103	5,012	63,041
5	,881	4,007	67,047			
6	,813	3,697	70,745			
7	,772	3,511	74,256			
8	,673	3,058	77,314			
9	,652	2,965	80,278			
10	,523	2,378	82,656			
11	,517	2,349	85,005			
12	,448	2,038	87,043			
13	,429	1,950	88,994			
14	,370	1,681	90,675			
15	,349	1,588	92,263			
16	,334	1,519	93,782			
17	,308	1,399	95,181			
18	,275	1,251	96,433			
19	,238	1,083	97,516			
20	,232	1,052	98,568			
21	,165	,751	99,320			
22	,150	,680	100,000			

Extraction Method: Principal Component Analysis.

TABLE 21: COMPONENTS EXTRACTED USING PERCEIVED SCORES (P)

An unconstrained principal components factor analysis was also carried out on the gap scores. The factor analysis displayed 5 components with recorded eigenvalues of above 1 for the analysis on the MSS correlation matrix (Q). These four components constitute a total of 61,788 per cent of the variance (see Table 22).

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7,686	34,935	34,935	7,686	34,935	34,935
2	2,433	11,061	45,996	2,433	11,061	45,996
3	1,263	5,742	51,738	1,263	5,742	51,738
4	1,211	5,503	57,242	1,211	5,503	57,242
5	1,000	4,546	61,788	1,000	4,546	61,788
6	,938	4,263	66,050			
7	,868	3,944	69,995			
8	,780	3,547	73,542			
9	,752	3,420	76,962			
10	,643	2,922	79,884			
11	,578	2,629	82,513			
12	,553	2,511	85,025			
13	,512	2,326	87,351			
14	,475	2,161	89,511			
15	,417	1,895	91,406			
16	,379	1,723	93,130			
17	,319	1,448	94,578			
18	,305	1,384	95,962			
19	,277	1,260	97,222			
20	,229	1,039	98,262			
21	,208	,944	99,206			
22	,175	,794	100,000			

Extraction Method: Principal Component Analysis.

TABLE 22: COMPONENTS EXTRACTED USING MSS SCORES

The factor analysis for the MSA correlation matrix was also performed. The factor analysis produced 4 components with recorded eigenvalues of above 1 (7,553; 2,287; 1,374; 1,147; 1,08). These five components explain a total of 61,040 per cent of the variance (see Table 23).

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7,553	34,331	34,331	7,553	34,331	34,331
2	2,287	10,396	44,727	2,287	10,396	44,727
3	1,374	6,244	50,971	1,374	6,244	50,971
4	1,147	5,216	56,187	1,147	5,216	56,187
5	1,068	4,854	61,040	1,068	4,854	61,040
6	,959	4,360	65,400			
7	,865	3,934	69,334			
8	,799	3,632	72,966			
9	,717	3,259	76,225			
10	,681	3,096	79,321			
11	,597	2,715	82,035			
12	,576	2,619	84,654			
13	,540	2,457	87,111			
14	,469	2,131	89,241			
15	,432	1,962	91,203			
16	,383	1,741	92,944			
17	,365	1,659	94,603			
18	,299	1,357	95,960			
19	,271	1,230	97,190			
20	,252	1,147	98,338			
21	,216	,981	99,319			
22	,150	,681	100,000			

Extraction Method: Principal Component Analysis.

TABLE 23: COMPONENTS EXTRACTED USING MSA SCORES

Pallant (2001) clarifies that using the Kaiser criterion is only one indicator for how many components to extract. Therefore, according to Pallant (2001), it is important to also consider the screeplots. It is recommended to look for a change (elbow) in the shape of the screeplot. Only components above this point are retained and indicate how many components to extract. PASW provides this feature and the corresponding screeplots are illustrated in Appendix C. Overall, the analysis of the four screeplots does not result in a clear different perspective than the Kaiser criterion. Still, an extraction of two fewer components for the MSS correlation matrix (three instead of five) could be considered. This view is partly supported by the analysis of the component matrices. Although most of the items load quite strongly (above .4) on the first components, very few items load on the last components in the discussed cases. This partially supports the consideration from the screeplots analysis to

consider a reduction of factors. The comprehensive component matrices can be found in Appendix D.

Once the number of factors has been determined, the next step, as detailed in Chapter 3.6.2 is the rotation process. As argued, this research uses as an extraction method referred to as the Principal Component Analysis and varimax with Kaiser Normalization as the rotation method. The varimax rotation was performed on the desired and perceived scores (E, P) as well as on the gap scores. Although, e.g. for the desired scores, five factors with eigenvalue greater than 1.0, accounting for 66,07 per cent of the variability could be extracted, the results from the factor rotation show no SERVQUAL pattern in terms of dimensionality (see Table 35 in Appendix E). In order to interpret the importance of each factor the eigenvalue and the variance explained need to be analysed. Similarly, to interpret the importance of the individual items within each factor the individual loading needs to be determined.

- The eigenvalue of factor I has been calculated to be 8,203 while the percentage of variance explained is 37,286 per cent. Within this factor "Maintaining error-free records" and "Making customers feel safe in their transactions" load the highest with 0,757 and 0,703 respectively. Three additional items ("Visually appealing materials associated with service", "Employees who instil confidence in customers" and "Employees who are consistently courteous") load above 0,6 while the four remaining items range between 0,434 and 0,455. Factor II holds an eigenvalue of 2,351 and explains a variance of 10,688 per cent producing a cumulative variance explained of 47,974. The two highest loading items are "Knowledgeable employess" (0,765) and "Giving customers individual attention" (0,732).

"Employees who deal with customers in caring fashion" and "Ability to respond to customer's request" range above 0,6 while the remaining three items load between 0,494 and 0,575. Factor III is comprised of a single item ("Visually appealing offices") that loads at 0,758 and five further items which load on factors I and II. The factor's eigenvalue at 1,704 is considerably lower than those of factors I and II. Factor III accounts for 7,747 per cent of the total cumulative variance of 55,721 per cent. Four items are allocated to factor IV which has an eigenvalue of 1,185. The variance explained is calculated to be 5,389 per cent increasing the cumulative variance explained to 61,110 per cent. The highest loading items are "Dependability in handling customers' service problems" (0,732) and "Providing customer service as promised" (0,696) which explains the substantial dependability character of this factor. "Providing customer service at the promised time" solely loads on factor V (0,752). Factor V has an eigenvalue of 1,091 and explains a variance of 4,960 per cent. The total cumulative variance explained is therefore calculated to be 66,070 per cent. Three additional items load on factor V with "Performing customer service right the first time" being the most important (0,719).

Similar observations are made for the other varimax rotations:

- A varimax rotation on the perceived score indicates that the items pertaining to the reliability and tangibles dimension tend to have a high loading on only one factor each. The responsiveness as well as the empathy and especially the assurance items load on several factors. The first factor has an eigenvalue of 9,717 and accounts for more than 44 per cent of the variability, with "Having

the customer's best interests at heart" and "Employees who understand the needs of their customers" loading the highest at 0,780 and 0,720 respectively. "Knowledgeable employees" ranks third (0,658). The remaining items load between 0,446 and 0,579. Factor II accounts for 8,070 per cent of the variance explained which produces as cumulative value of 52,240 per cent. The eigenvalue at 1,775 is considerably lower compared to the eigenvalue of factor I. The highest ranking items of factor II are "Providing customer service at the promised time" (0,729), „Dependability in handling customers' service problems" (0,724) and "Providing customer service as promised". The least important items of factor II are "Employees who deal with customers in caring fashion" (0,416) and "Giving customers individual attention" (0,438) which also load on factor I. Factor III accounts for 5,788 per cent of the variance explained while having an eigenvalue of 1,273. "Modern equipment (e.g. trucks, SAP)" (0,782), "Sales persons who have a neat, professional appearance" (0,727) and "Visually appealing offices" (0,714) load the highest of the five items that build this factor. Factor IV consists of the two items "Willingness to help customers" (0,758) and "Employees who are consistently courteous" (0,648) and has an eigenvalue of 1,103. The cumulative variance explained is calculated to be 63,041 per cent of which 5,012 per cent are assigned to factor IV. A summary of the rotated components with loadings greater than 0.40 is shown in Appendix E.

- Also the next varimax rotation with Kaiser Normalization was performed on the difference scores of MSS (P-E). The principal component factor analysis of this MSS score extracts 5 factors with eigenvalues greater than one. The

rotated scores indicate that reliability and tangible items and – to certain extend – empathy load on only one factor each, whereas the items of the other two dimensions tend to split and load on several factors. The first factor explains a variance of 34,935 per cent and holds an eigenvalue of 7,686. The three highest ranking items of this factor are “Visually appealing offices” (0,775), “Sales persons who have a neat, professional appearance” (0,760) and “Modern equipment (e.g. trucks, SAP)” (0,720). The remaining four items load between 0,418 and 0,667. Factor II is comprised of eight factors, has an eigenvalue of 2,433 and accounts for 11,061 per cent of the variance explained. The three factors ranking above 0,7 are “Providing customer service as promised”, “Dependability in handling customers' service problems” and “Performing customer service right the first time”. Factor III with an eigenvalue of 1,263 explains a variance of 5,742 per cent thereby increasing the cumulative variance explained to 51,738 per cent. This item is comprised of three factors with “Maintaining error-free records” (0,825) loading the highest. Factors IV and V have eigenvalues of 1,211 and 1,000 and add 5,503 and 4,546 per cent respectively to the total cumulative variance explained of 61,788 per cent. Table 37 in Appendix E shows the rotated components in greater detail.

- For the MSA - difference data, five factors account for more than 60 per cent of the variance. Factor contributes 34,331 per cent to the cumulative variance explained and has an eigenvalue of 7,553. The top three items are “Visually appealing offices“ (0,797), „Sales persons who have a neat, professional appearance” (0,790) and “Visually appealing materials associated with

service" (0,716). The remaining four items range between 0,427 and 0,590. With an eigenvalue of 2,287, factor II contributes 10,396 per cent to the cumulative variance explained of 44,727 per cent. "Employees who understand the needs of their customers" (0,770) and "Knowledgeable employees" (0,733) load the highest within this factor. "Employees who deal with customers in caring fashion" ranks lowest for factor I (0,427) and second lowest for factor II (0,509). Factor III accounts for 6,244 per cent of the variance explained. The corresponding eigenvalue is calculated to be 1,374. The highest loading item of five items in total is "Providing customer service as promised" (0,819) followed by "Dependability in handling customers' service problems" (0,790). "Making customers feel safe in their transactions" (0,779) leads the items loading of factor IV which has an eigenvalue of 1,147 and explains a variance of 5,216 per cent. The total cumulated variance explained of all five factors stands at 61,040 to which factor V contributes 4,854 per cent. "Maintaining error-free records" (0,780) is the only item that solely loads on factor V. There are three other items loading on factor V which are in order of importance "Convenient business hours" (0,622), "Providing customer service at the promised time" (0,506) and "Modern equipment (e.g. trucks, SAP)" (0,479).

Thus, the exploratory factor analysis failed to reveal the specified five dimensions as suggested in 1991 (Parasuraman et al.). For all four - the perception and desired data as well as the two difference data - rotation results could neither identify any obvious dimension structure, nor could the dimensionality of the original SERVQUAL-concept be demonstrated. This result is consistent with the ones obtained in other

studies (see Saurina and Coenders, 2002). The results suggest that different dimensional structures may be found when different types of scores are used.

The exploratory factor analysis process could neither validate nor remodel the five dimensional structures of SERVQUAL. Some evidence could be detected that supports a five dimensional structure with different items than suggested by the original authors. Other evidence seems to support a 3-dimensional structure consisting of tangibles, reliability, and a single factor composed of items from responsiveness, assurance, and empathy. Parasuraman et al. (1994, 211) report a similar observation, stating that although the service quality scores exhibit good internal consistency among SERVQUAL's five dimensions, the results of the factor analysis show evidence to support *the possibility of a three-dimensional structure wherein responsiveness, assurance and empathy meld into a single factor.* However, to further judge on the validity of SERVQUAL as a measurement tool in the European nylon intermediates industry further tests on validity need to be conducted.

4.4.2 Confirmatory Factor Analysis

Utilising the structural equation modelling abilities of AMOS, the confirmatory factor analysis results were investigated for goodness-of-fit and construct validity. The determination of model fit is discussed in detail in Chapter 3.6.2 and applied here. To briefly summarize, fit indices have no single statistical test of significance that identifies a correct model given the sample data (Schumacker and Lomax, 1996). There are a number of goodness-of-fit indices with which to make comparisons (see Chapter 3.6.2), thus fit, according to Hair et al. (2010), should be simultaneously evaluated from the perspective of multiple fit statistics.

Consequently, Hair et al. (1998, 653) claim *no absolute test is available, and the researcher must ultimately decide whether the fit is acceptable*. After assessing the model's validity based on certain goodness-of-fit measures, evidences of construct validity need to be investigated.

	MSS	MSA	Perception (P)	Desired (E)
Chi-square	348,008	326,504	350,761	498,177
Probability level	0,000	0,000	0,000	0,000
Degrees of freedom	199	199	199	199
Chi-square/degree of freedom	1,749	1,641	1,763	2,503
Goodness of fit index	0,782	0,804	0,782	0,721
Root-mean-square residual	0,083	0,077	0,084	0,117
Normed fit index	0,7	0,71	0,76	0,70
Tucker-Lewis Index	0,814	0,835	0,857	0,698
Comparative fit index	0,839	0,858	0,876	0,74
Adjusted goodness of fit index	0,722	0,751	0,723	0,645

TABLE 24: CONFIRMATORY FACTOR ANALYSIS – FIT TESTS

Table 24 features several fit indices used for evaluating the SERVQUAL five-dimensional structure for the European nylon intermediates industry. Again, the two gaps, as well as the two perception measures are analysed.

As elaborated on in Chapter 3.6.2., the chi-square test simultaneously tests the extent to which the specification is true. The probability value associated with chi-square represents the likelihood of obtaining a chi-square value when the null hypothesis is true. Thus Byrne (2001, 81) concludes, *the higher the probability associated with chi-square, the closer the fit between the hypothesised model and the perfect fit.* The assumption is that customer service quality in the European nylon intermediates

industry has a five-factor structure. Examining the gap scores (MSS, MSA) first, the chi-square fit of the hypothesised (five-factor) model was evaluated. The chi-square value of 348,1 was calculated for the MSS scores and 326,5 was calculated for the MSA scores. Next the chi-square values for the perceived and desired scores were computed. The degree of freedom was assessed to be 350,7 and 498,2 respectively.

All models had a degree of freedom of 199, since all models have 22 observed variables and 27 unobserved variables (22 errors associated with each of the variables and the five latent variables). The number of parameters to be estimated is 54. These numbers translate into 199 degrees of freedom [P(P+1)/2]-h, where P is the number of observed variables and h is the number of parameters to be estimated (Byrne, 2001). The probability values along the analysis were less than 0,0001.

The normed chi-square adjusts the chi-square value taking the number of degrees of freedom into consideration. The normed chi-square values are 1,749 and 1,641 for the gap scores, MSS and MSA respectively and 1,763 and 2,503 for the perceived and desired scores respectively. The values of 1,749 and 1,641 as well as 1,763 fall well within the acceptable range of 1,0 to 2,0 according to Byrne (2001). The value for desired scores with 2,503 is above this level. However, Hair et al. (2010) consider a value below 3 acceptable.

The GFI and the AGFI were introduced as absolute indexes of fit because they basically compare the hypothesised model with no model at all (Byrne, 2001). The AGFI differs from the GFI only in that it adjusts the number of degrees of freedom in the specified model. The GFI and the AGFI for the models are also given in Table

14. For GFI and AGFI the scores provide indexes well below the recommended 0,90 and only the GFI value for the MSA analysis gives a value above the cut-off of 0,80.

The Root Mean Square Error of Approximation (RMSEA) or the Root mean square residual (RMSR) is the square root of the mean of the squared residuals. One of the most widely used measures that attempts to correct for the tendency of the chi-square GOF test statistic to reject models with a large sample or a large number of observed variables is the root mean square error of approximation. Although previous research sometimes points to a cut-off value of .05 or .08, more recent research alludes to the fact that drawing an absolute cut-off for RMSEA is inadvisable. Table 13 illustrates the figures for the gap scores (0,083 and 0,077) and for the perception scores (0,084 and 0,117).

The normed fit index measures a ratio of the difference of the chi-square value for the fitted model and a null model divided by the chi-square for the null model. It ranges between 0 and 1, and a model with perfect fit would produce an NFI of 1. The measures for the gap as well as perception scores showed values below the recommended cut-off value of 0,9 (see Table 13).

The Tucker-Lewis index (TLI) is conceptually similar to the NFI, but it varies to the respect that it is actually a comparison of the normed chi-square values for the null and specified model, which to some degree takes model complexity into account. Typically models with good fit have values that approach 1, and a model with higher value suggests a better fit than a model with a lower value. Additionally, the comparative fit index is an incremental fit index that is an improved version of the normed fit index. The CFI is normed so that values range between 0 and 1, with

higher values indicating better fit. CFI values above .90 are usually associated with a model that fits well (Hair et. al 2010). When applying the above fit measures, TLI and CFI, all of the fit indexes were relatively stable at 0,85, which is below the value of good-fit of 0,9, but above the cut-off of 0,8. Nevertheless the values for the desired scores provided unacceptable levels of fit with 0,698 and 0,74 for TLI and CFI respectively.

In sum, the tests for acceptable levels of goodness-of-fit indicated that the hypothesised five-factor model as conceptualised by Parasuraman et al. (1990) finds only moderate to weak support. Similar results have been obtained from other researchers, trying to validate the five dimensional SERVQUAL structure in a business-to-business environment (e.g. Durvasula et al., 1999). Next evidence of construct validity is to be analysed.

Several ways are available to estimate the relative amount of convergent validity among item measures as stated in Chapter 3.6.2. One important consideration is the size of the *factor loadings*. A high convergent validity combined with high loadings on a factor indicates that they converge on a common point, the latent construct. At a minimum, Janssens et al. (2008) state, the variable measures must all have high loadings (> .50) on the latent variables and must be significant (Critical Ratio = t-value > 1.96).

	MSS	MSA	Perception (P)	Desired (E)
Reliability	0,71	0,61	0,73	0,63
Responsiveness	0,60	0,64	0,70	0,63
Assurance	0,57	0,60	0,72	0,67
Empathy	0,62	0,67	0,71	0,61
Tangibles	0,69	0,63	0,55	0,75

TABLE 25: ASSESSMENT OF CONVERGENT VALIDITY

The condition that each of the loadings must be significant and that the t-values have to be above 1.96 was met. AMOS labels this C.R. (Critical Ratio) and all dimensions and models fulfilled this requirement and were therefore significant. A stricter condition is that the correlation between each indicator and the corresponding variable has to be greater than 0,5. This condition was also satisfied as illustrated in Table 25.

In summary, it can be stated that the test for convergent validity offered strong support for the five-factor model of customer service quality in the European nylon intermediates industry.

4.6 Recapitulation

The nylon intermediates market is a highly tangible business-to-business market that is characterised by a high concentration of suppliers and buyers. This research focused on Lanxess, a key supplier within this highly tangible transaction-oriented market, and addressed the strategic challenges of customer service and its quality.

Based on intensive research, Parasuraman, Zeithaml and Berry developed a theory, which is widely applied and commonly used in business-to-consumer markets. This thesis leveraged Parasuraman, Zeithaml, and Berry's SERVQUAL concept in the European nylon intermediates business and market setting and addressed the following objectives:

- For the first-time, reveal how Lanxess' customer service is perceived by its customers and quantify these findings
- Evaluate the service dimensions and assess which service dimension of the customer service process is considered to be of high or low importance for the customers
- Develop and validate a slightly adapted SERVQUAL instrument for the nylon intermediates industry
- Assess the usefulness and adaptability of SERVQUAL as a tool in a low involvement, highly transaction oriented business-to-business market

The overall aim of the thesis was to assess and validate quality and satisfaction theory to enhance the management of competitive advantage in the sector of the European nylon intermediates industry. In order to fulfil this aim a slightly adapted SERVQUAL instrument was developed and applied to foster the understanding of the applicability and robustness of the SERVQUAL scale in an untapped business-to-business setting. Chapter 4 elaborated and assessed the research objectives in-depth.

4.6.1 Research Objective: Customer Service

At the beginning of the chapter it was shown how customers perceive Lanxess' customer service. This first-time analysis considered the characteristics of the respondents, their overall assessment of the service quality of Lanxess as well as the

individual items of the SERVQUAL battery (Chapter 4.2). The data analysis firstly revealed how its customers perceive Lanxess' customer service. Different ways of understanding customers' perception of Lanxess' customer service quality were discussed. Firstly, a SERVQUAL independent measure was elabored on in detail. It could be shown that the customers' perception of service quality on average measured 5.83 on a scale of 1 to 7. Additionally, differences in terms of the participants' background potentially influencing individual ratings were detailed and analysed. It was shown that customers from medium to small enterprises regard the customer service offering of Lanxess higher than those of bigger companies. Similarly, customers with long-term business relations to Lanxess rate the service offering more positively than customers with a shorter duration of business affairs.

Next the rankings of the SERVQUAL items rating were discussed and illustrated. The descending sequence of the three SERVQUAL rankings - perceived, desired, and minimum - showed that from the five highest rated items four are identical for all three rankings. Furthermore, the overall average score for the perceived customer service quality was computed to be 5.735. Similarly, the means for desired and minimum rankings were developed and achieved values of 5.768 and 4.284 respectively.

It was shown that customers' perception of Lanxess' customer service quality and the desired service quality are almost matching on an overall scale. Next it was postulated that customers' desired level of service quality - for several items - is substantially higher than the perceived customer service quality from Lanxess. However, the analysis showed that Lanxess' customer service quality for all items is considered to exceed the minimum service quality required. It was proven that for a

range of SERVQUAL items with slightly lower desired levels of service quality Lanxess' customer service significantly outperforms the desired level.

4.6.2 Research Objective: Dimensions

Chapter 4.3 answered the next research objective and evaluated which service dimension of the customer service process is considered to be of high or low importance for the customer. First, reliability tests were conducted. The computed Cronbach's alphas demonstrated a high reliability of SERVQUAL's dimensions. It was shown that for all perceived and minimum scores as well as gap scores, the reliability estimates of the five-factor model were generally good with the one exception of the assurance and responsiveness dimension at the MSS gap score where reliability estimates were only modest. The conducted reliability analysis therefore provided strong support for the five-factor SERVQUAL model and the SERVQUAL battery could be analysed along the five-dimensional structure. Although the results indicate consistent score reliability, it was stressed that reliability is score specific and not instrument specific and may vary across administrations of a protocol (Vacha-Haase, 1998).

Taking this into consideration, it was analysed how Lanxess' customer service is perceived by its customers per dimension. Service quality was subsequently calculated in this manner for each dimension using performance-only scores and difference scores based on performance minus expectations and performance minus minimum. Reference was made to the different dimensions as well as the influence of the respondents' profile. Additionally, in order to later assess which service dimension is of higher respectively lower importance for the customers, the

minimum scores were also analysed. The analysis showed that customer service quality for the reliability dimension is rated highest for perceived and MSS scores.

The analysis also demonstrated that one SERVQUAL dimension – tangibles – is perceived significantly better than desired. To that respect, Lanxess' customer service significantly outperforms the desired service quality of that dimension and questions were addressed if and how to take advantage of this observation. Finally, the importance of the service dimensions was assessed. The investigation demonstrated that the reliability dimension is regarded as the most important customer service dimension. However the low importance rating of the tangibles dimension was most revealing. Reasons for the low scoring were analysed and it was questioned which consequences may be derived for the service offering of Lanxess.

It needs to be stressed that the underpinning idea of this research was to apply SERVQUAL to this highly tangible, business to business sector. From the start, the concept was acknowledged as potentially useful, though the project had symmetry in that it would be equally interesting if the results would not have emerged as expected. A critical research protocol decision was made to implement the SERVQUAL construct according to the design of the originators – Ananthanarayanan Parasuraman, Valerie Zeithaml and Leonard Berry. There are two elements of the construct – first the content of the dimensions and secondly the gap that is considered to be an indicator of satisfaction explained as the gap between expectation and experience. The implementation of the construct to measure the concept of service quality was developed over a series of papers ranging from 1988 to 1994 (Parasuraman et al. 1988, 1991, 1994). It began with a series of qualitative interviews and culminated in a multivariate statistical process in which the original

12 dimensions were reduced to five. The gaps were addressed in a number of different ways

It is worth mentioning that the importance and experience gap has resonance with the earlier work of Fishbein and Ajzen (1975), and Ajzen and Fishbein (1980) on attitude measurement which is based on importance and belief (experience) regarding the attributes of a brand or product (multi-attribute attitude scales). There are parallels with Parasuraman, Zeithaml and Berry's approach to the identification and measurement of perceptions of service quality which is certainly something that could be researched further if the researcher is interested in considering the development of theory and is pertinent to the discussion of whether this approach could be enhanced and thus the measurement construct for service quality.

In this instance however, the objective of the research was to apply the SERVQUAL construct. To this end, all of the approaches that were suggested by the Parasuraman, Zeithaml and Berry team were incorporated into the research instrument design as loyally as possible. Given the objective to test the construct in this setting, this was considered to be important as it overcomes any criticism that adaptation of the method led to the result. In other words it facilitates the validation of the approach as the originators described it. Any adaptation was within the guidelines suggested in the Parasuraman et al. (e.g. 1988, 1991, 1994) literature and concerned the adaptation of the vocabulary of the dimension scales to be in line with the firm/ industry/sector context of the application.

The use of the label of minimum service level needs to be seen in the context of the overall research. It is a notion that is addressed in the literature. The reasoning

behind the use of ‘minimum acceptable service levels’ and ‘desired service levels’ was my interpretation of the guidance in the literature for the implementation of SERVQUAL. This advice is to define the expectations of service quality as the ‘desires or wants of consumers, i.e. what they feel a service provider should offer rather than would offer’ (Parasuraman et al. 1988: 17). The survey was pre-tested extensively and subject to scrutiny of expert panels. These panels considered the design of the survey in detail and found the chosen wording the most effective. The question itself is presented as ‘my minimum service level is: (low to high)’ and thus gives an element of relativity to the responses – both in terms of between items for one individual and between individuals. Implicit in this column of the survey is that the low to high responses indicate that the item must reach a certain level – if this level is high, then the importance is high. The second column is about the desired service level. The gap between these has an important implication – if both are high then there is certainly a high level of importance. If there is a gap, the minimum is low and the desired is high, then there is the potential to add value by meeting a desired level, but relatively it is not important to do so to satisfy a customer. Thus it is important not to see the minimum acceptable level as a stand-alone proxy for importance but to take this in the entirety of the instrument and data analysis to appreciate its use in this context.

The survey included a single item that asked for a rating of the overall service quality of Lanxess. This serves as an addition to SERVQUAL and also as a check that the outcomes of the computed results regarding perceptions of service quality are appropriate in this implementation of SERVQUAL. This also gives a form of internal reliability of the SERVQUAL application. It is a variation of the SERVPERF model

and could provide an insight into the theoretical validity of the two approaches. From a theoretical perspective, this further analysis could be undertaken to consider theoretical implications of this research and this will be included in the academic publication of the research. It is my intention to publish from this research and this analysis will form the basis of a potential theoretical paper comparing theory and utilising Lanxess as a case study. This is in comparison to the objectives of the DBA which specifically sets out to apply SERVQUAL to this particular business context.

Given the nature of the DBA and the research objectives for this thesis, it goes beyond the remit of this situation, but provides a further agenda for consideration. It highlights the relationship between theory and practice and provides the basis for discussion of the emergent nature of theory which was implicit in the original Parasuraman, Zeithaml and Berry work over a period of six years.

It is the association of service level with importance that is, on reflection somewhat misleading as this element of the survey does in fact concern expectations expressed in the form recommended in the model.

4.6.3 Research Objective: SERVQUAL

Next, in order to extend the use of theory to a specific application and thus contributing not only to practice of management but also to theory, the validation process of the slightly adapted SERVQUAL instrument for the European nylon intermediates industry was conducted. Here the third research objective was addressed. The evaluation of the appropriateness of the measurement model was based on the analysis procedures introduced in Chapter 3.

Additionally, as suggested by Babakus and Mangold (1992), corrected item-to-total correlations were also examined; the scores for an item and the summated scores of the rest of the items comprising a subscale (e.g., the subscale measuring the assurance dimension of service quality) were correlated. These analyses were conducted for the desired and perceived measures, as well as for the computed gap measures of MSA and MSS. Further convergent validity of SERVQUAL was checked by measuring the extent to which each item correlated with items in the same factor or dimension. The analysis provided further support of the five-dimensional SERVQUAL structure as suggested by Parasuraman, Zeithaml and Berry (1990). However, it could be demonstrated that for all perceived and desired scores, the reliability estimates of the five-factor model were generally better. This observation added to the ongoing discussion of SERVQUAL's difference-score conceptualization. As early as 1990 Parasuraman, Berry and Zeithaml (1990, 1993, 1994) started to respond to critique concerning the gap model for example in response to Brown, Churchill and Peter (1993) and likely most prominent to Cronin and Taylors' SERVPERF (1992). Chapter 3 elaborated on this discussion in detail.

The conducted reliability analysis provided support for the five-factor SERVQUAL model. In order to fully confirm the slightly adapted SERVQUAL as a valid instrument for measuring service quality in the European nylon intermediates industry the model's validity also needed to be proven. Chapter 4.5 assessed the validity of the model applying both exploratory as well as a confirmatory factor analysis.

The exploratory factor analysis process could neither validate nor remodel the five dimensional structures of SERVQUAL. Some evidence could be detected that

support a five dimensional structure with different items than suggested by the original authors. Other evidence seemed to support a 3-dimensional structure consisting of tangibles, reliability, and a single factor composed of items from responsiveness, assurance, and empathy. The confirmatory factor analysis based on the tests for acceptable levels of goodness-of-fit indicated that the hypothesised five-factor model as conceptualised by Parasuraman et al. (1993) gained only moderate to weak support. However the test for convergent validity offered strong support for the five-factor model of customer service quality in the European nylon intermediates industry.

Similar results have been obtained from other researchers, trying to validate the five dimensional SERVQUAL structure in a business-to-business environment (e.g. Durvasula et al., 1999). Bienstock et al. (1997) raised concerns that the dimensions of SERVQUAL may not be universally applicable across different types of business-to-business contexts.

4.6.4 Research Objective: Usefulness of SERVQUAL

In the context of SERVQUAL, Parasuraman, Zeithaml, and Berry (1998) postulate the existence of a second-order abstraction of service quality that is conceptually generalisable across industries, brands, and product classes, and hence a measurement scale that permits cross-industry and cross-product comparisons. Therefore, another objective of the research was to assess the usefulness and adaptability of SERVQUAL as a tool in a low involvement, highly transaction oriented business-to-business market setting. Several studies have concluded that the SERVQUAL instrument does not consistently measure the same factors and that

indeed structure may be context specific (Van Dyke et al., 1997, Carman, 1990, Babakus and Boller, 1992, Cook and Thompson, 2000). Cook and Thompson state although few researchers seem to argue that SERVQUAL measures quality to some extent, the underlying factors defining quality seem to be partially inconsistent across business contexts. The results of this analysis presented in Chapter 4 support this view.

The findings raise concerns about the extension of the SERVQUAL scale to customer service in a low involvement, highly transaction oriented business-to-business market setting.

The usefulness of SERVQUAL is questioned by the dimensional concept of the model as discussed in Chapter 4.6.3. Even though the SERVQUAL dimensions themselves appear to be internally reliable for the context of customer service, the overall SERVQUAL model has limited discriminant validity. Based on the findings of applying SERVQUAL for measuring customer service quality, the five-component structure as suggested by Parasuraman et al. (1991a) was not confirmed.

As other authors suggest, due to differences between consumer and industrial characteristics, it is likely that the instrument needs to be specifically tailored to the setting under investigation. Such advice is in line with findings of several other studies demonstrating that service quality measures exhibit a factor structure that varies across industries (Brown et al., 1993, Babakus and Boller, 1992, Durvasula et al., 1999, Cronin Jr. and Taylor, 1992). The results also showed that SERVQUAL's five dimensions might be reduced to a smaller number. In fact this finding is in agreement with research results by Mels et al. (1997) and Duraslav (1999) et al.

Hence, demand for further research as requested by Duraslav (1999) and others is needed to determine if the SERVQUAL scale can be reduced to a leaner structure or respectively to assess the validation of the five dimensional structure of SERVQUAL in the customer service setting.

Further the results presented in Chapter 4 reinforce the concerns by others who have identified serious psychometric limitations with the gap or difference scores (Durvasula et al., 1999). The research clearly indicates that perception measures alone seem to be adequately indicating service quality levels in the European nylon intermediates markets. This observation might suggest that perceptions of the service quality are comparative rather than absolute, so no other measure of gap is required as suggested by Saurina and Coenders (2002). While this study represents one of only a few studies that extended the SERVQUAL scale to business-to-business markets, and being the first in a highly transaction oriented business-to-business market setting, it does not propose an alternative scale to measure service quality. Future work in this area is highly required in order to address the above raised concerns and to provide a simpler alternative to SERVQUAL.

The usefulness of SERVQUAL in analysing customer service should be further evaluated and refined through rigorous methods in the highly transaction oriented business-to-business market settings. As any other assessment tool, SERVQUAL is best applied in a thoughtful manner, being fully aware of its present strengths and weaknesses and in full knowledge of what it can and cannot deliver.

4.6.5 Managerial Implications

Although the SERVQUAL instrument may not be directly transferable to customer service in a low involvement, highly transaction oriented business-to-business market setting it does offer direction in terms of identifying the important attributes associated with specific service items.

The research reveals Lanxess' service performance with regards to the SERVQUAL items. It was shown that Lanxess' customer service outperforms the customers' expectations in several occasions. Here the research guides management to develop actions in terms of expectation management. It is crucial to understand what happens if Lanxess' offering is inferior to customers' expectations and management needs to be prepared to counteract possible negative effects.

Further the strong emphasis on the high importance of the reliability items offer managerial impulses for specific marketing actions. It might be interesting to study the opportunities that arise through a 'reliability promise' of Lanxess to its customers. Lanxess could be able to charge a premium for certain reliability promises that differentiate Lanxess from its competitors.

The research study also provides benchmark performance standards for Lanxess' customer service. Strengths and weaknesses of the customer service offering can be examined in terms of organisational performance as well as customer perceptions of service quality. Customer service can be measured over time and improvement actions can be efficiently judged. Additionally, as suggested by Mehta and Duraslav, methodological guidelines and suggestions on operationalisation of variables are

provided which can be used for monitoring performance. Lanxess has gained a methodological approach and tool framework to conveniently measure performance perceptions over time. A simplified version of this service quality measurement can be used without including customer expectations or even without minimum requirements.

Though findings of the study may apply to various business-to-business customer service settings including chemicals in Europe or elsewhere, future research is needed to judge service quality measures when applied to other types of business-to-business areas. Authors suggest that future research of measuring service quality should attempt to modify the questionnaire to be able to capture the true quality of the service offered, and to better reflect the situation of the particular service (e.g. Badri et al., 2005). However, by examining SERVQUAL's application to the highly tangible European business-to-business market, this study offers insight into the application of the scale to business-to-business marketing. And finally, while this study is based in the European nylon intermediates market, the procedure outlined in the research can be easily applied to other regions respectively global markets.

Further, the research places focus on the value of customer service in a highly tangible market environment. In the course of the research, particularly during discussions with practitioners, it became apparent within Lanxess that the need to understand what constitutes customer service quality is evident. Van Dyke's et al. (1997) conclusion, nothing can be managed what cannot be measured, became paramount once again. Even though it might not be possible to develop a generic service quality measurement instrument applicable for all circumstances, the managerial task to respond to customers' expectations, and to better understand how

customers judge customer service quality, persists. Applied in a thoughtful manner, SERVQUAL may prove to be a useful tool for this purpose.

CHAPTER 5 – DISCUSSION

Inadequate customer service can have drastic consequences for a business which may include loss of orders, increased complaints, lower prices, delayed payments and generally lower supplier ratings. In today's fast changing global market and highly competitive environment customer service can provide important competitive differential advantages to market players. Despite the benefits demonstrated, in an actual business setting it was observed that companies in the nylon intermediates industry have not yet fully explored the full potential of customer service.

The thesis encompassed the topic of service quality both from an academic but also practical perspective allowing to identify conceptual limitations of the instrument and implications for future research but also to develop implications for the practice of management. Finally, reflections on the research process complete this thesis.

5.1 Conceptual Implications

This research focused on Lanxess, a key nylon intermediates supplier within a highly tangible transaction-oriented market, and addressed the strategic challenges of customer service and its quality. Based on Parasuraman, Zeithaml and Berry's SERVQUAL concept the discussion on service and its quality was elaborated on.

During the course of the research concept related benefits as well as shortcomings could be identified.

SERVQUAL has been proven a valuable instrument in various business settings and different market environments. As detailed in Chapter 2.3, the concept has been well researched not only by its inventors Parasuraman, Zeithaml and Berry but also by numerous researches including e.g. Babakus and Boller (1992), Cronin and Taylor (1992), Bateson and Hoffman (1999), who partially challenged the instrument and hence, added to the enrichment of SERVQUAL.

The thorough, academic review of SERVQUAL as a fundamental part of the thesis has comprehensively illustrated the instrument from a scientific point of view while it has also been elaborated on numerous applications in business settings which have underlined the practicality of the tool. This practicality and the general usefulness of the tool have also been proven during the course of this research. The well-structured SERVQUAL approach could be readily followed by the researcher and generally leans itself to application not only in B2C but also in B2B settings, making SERVQUAL a viable option for researching service quality.

The clear and easy to follow structure of the instrument proved to be beneficial for the participants during the data collection process. The questions are phrased in an adequate level which enhances a rapid understanding on the part of the answering person. Moreover, the time commitment is manageable so that the answering process did not require participants to spend a substantial amount of time filling in the questionnaire.

Adding to the conceptual benefits of applying SERVQUAL it is to be highlighted that the tool enhances the overall awareness for service quality. As repeatedly stressed during the course of this research, many companies in the European nylon intermediates industry do not appreciate the value adding potential of service quality and hence do not assign sufficient resources towards a sound understanding of this crucial part of the offering. In an environment where service quality is not adequately addressed, introducing SERVQUAL can potentially direct towards developing an improved comprehension of the importance of customer service quality. Considering the application of an instrument such as SERVQUAL is the first step of a comprehensive process to comprehend the magnitude of service quality.

Once applied and analysed, the results of the SERVQUAL tool allow a company to gain a solid understanding of its customers' expectations regarding service quality while also directly disclosing how the company is performing. The clearly structured results foster a quick realization of the areas the company is exceeding customers' expectations but also distinguishes those topics the company has to improve on. Moreover, it also reveals how competition is performing which gives an enterprise a sound appreciation of its competitiveness within a business setting.

As already discussed in Chapter 3.9 conceptual limitations of the used research construct are mainly grounded in the SERVQUAL instrument itself. Although SERVQUAL has huge benefits in its conceptual approach and operative application, several authors have listed critique about the tool or its application. Some of the mentioned shortcomings and difficulties with SERVQUAL were indeed experienced during the course of the research.

Buttle (1995) structures the discussion along theoretical and operational challenges concerning SERVQUAL and its usage (see Figure 13). Two of the main theoretical based arguments criticising SERVQUAL's usage were also witnessed during this research. Buttle (1995) challenges the gaps model of quality by stating that difference scores do not provide any additional information beyond those already contained in the perception model and that the gap model fails to capture the dynamics of changing expectations. Although this research follows the approach of Berry, Parasuraman, and Zeithaml, that gap scores are best calculated and used to diagnose service quality shortfalls and overachievements, Buttles' critique remains understandable (Chapter 3.9). The second conceptual challenge listed by Buttle (1995) which gained support during the research is the discussion regarding SERVQUAL's five dimensional structure. He claims that SERVQUAL's five dimensions are not universal and the number of dimensions comprising service quality are setting dependent. Additionally, Buttle (1995) claims that items do not always load onto the factors which one would expect them to. This conceptual limitation was also experienced in this research.

5.2 Implications for Future Research

The development and validation of SERVQUAL as a standardized measurement scale that enables researchers and practitioners to compare the results of studies across industries was one of the research's objectives. This study determined the applicability of such a scale in the European Nylon intermediates industry.

As discussed in Chapter 3.4, based on the literature and pre-test results, all items were worded positively. This, as Babakus and Mangold (1992) rightly claim, places a limitation on the study because a balanced mix of negative and positive items can uncover data quality problems at an early stage provided that item responses are carefully scrutinized before further analysis. There is a need to compare the results from such a mix with those form all-positive connotations. Further in the process, a number of wording changes were imposed on the original scale as a consequence of suggestions from the literature research, expert sessions as well as academic panels. Some of the results may be due to these changes, because every time an original scale is revised, a new construct is defined.

Questions were raised about SERVQUAL's five-dimensionality and its validity. The research failed to retrieve SERVQUAL's presumed five interrelated, first-order dimensions: tangibles, reliability, assurance, responsiveness, and empathy. This supports the claim of several authors that the instrument does not consistently measure these same factors, and that indeed structure may be context specific (e.g. Babakus and Boller 1992). Few researchers seem to argue that SERVQUAL measures quality to some extent; however, the underlying factors seem to differ across industries or contexts. The results of this study within the European nylon intermediates industry lend credence to this view. Studies on academic libraries to date indicate fairly consistently that there are three rather than five factors underlying perceptions of quality service in the SERVQUAL protocol (Cook and Thompson 2000). Additional research needs to be undertaken to identify factors that may underlie quality service as a construct in the context of highly tangible markets. These new theories then need to be rigorously tested for construct validity.

Additionally, future research might also focus on the paradigm of (highly tangible) markets itself. Grönross (2007) agrees that the core competence of a manufacturing firm is mainly related to how to manage manufacturing processes and on gaining an understanding of the customers' processes in a technical sense. A firm therefore offers its customers a technical solution for a technical process, and this technical solution should make the customers' technical process function more efficiently.

This goods-centered perspective is lately challenged by Vargo and Lusch (2004) who state that this view does not consider the effects on the customer s' value creation and business process in an explicit way. They claim that marketing is shifting away from the exchange of a tangible goods logic towards the exchange of intangibles, specialized skills and knowledge, and processes (doing things for and with), which they believe points marketing towards a more comprehensive and inclusive service-dominant logic. This logic integrates goods with services and provides a richer foundation for the development of marketing thoughts and practise (Vargo and Lusch, 2004). In their view competitive advantage is not solely based on e.g. the nylon intermediates themselves, but rather on the collaborative ability (of Lanxess) to allow for commodities to also provide service to the customer. Competitive advantage is firm-based rather than product based and thus, while the nylon intermediates provided might be commodities, the firm has the potential to be highly differentiated (Lusch et al., 2007).

Adopting this perspective of marketing, in which the purpose of a company is not to make and sell (Haeckel, 1999) units of output but to provide customized services to customers, the role of manufacturing changes. Tangible goods serve as part of the service provision rather than being the complete offering in itself. According to this

perspective, companies may find opportunities to offer knowledge and skills during the value creation process and charge a premium, thus finding a competitive advantage by focusing on the total process of consumption and use (Lusch et al., 2007).

This view would also require a new perspective of customer service as conceptualised in this research. This thesis has demonstrated customer service to resemble more to the petals of Lovelock's (1994) flower rather than to its core offering. Therefore, this research has emphasised the general quality of interaction between a seller and a customer, rather than the quality of the specific core offering. Future research might follow Vargo and Lusch (2004) who postulate that marketing should lead the effort of designing and building cross-functional business processes. Hence, the relationship to customers and the relationship building process with customers becomes intrinsic not only to marketing but also to the firm as a whole. All employees are identified as service providers, with the ultimate goal of satisfying the customer.

It might not be enough to simply provide customers with a technical solution for a technical process. Customer service might be only one element of a process of providing customers with the support needed to be able to create adequate value in their processes. This means for Lanxess that the physical product nylon intermediates still exists but from having been the key output of Lanxess' production processes it becomes one input among others for the entire customer's process (Grönroos, 2007). The physical product becomes a resource alongside a range of other resources needed in the constant flow of supporting the customer s' processes. This flow of

resources and activities happens in a continuous process and ultimately, this entire process takes the place of the stand alone traditional product (Lusch et al., 2007).

Hence, future research should investigate customer service as an integral part of the input into customers' processes, instead of limiting this to outputs of its productive, administrative and other processes, with the overall goal to support the value creation in the customers' processes.

5.3 Implications for the Practice of Management

One reason for conducting this research was to assess the usefulness and adaptability of SERVQUAL as a tool in a low involvement, highly transaction oriented business-to-business market. The results show that SERVQUAL provides market participants in the European nylon intermediates industry with a practical approach for the measurement of customer service quality. Strongly positive scores on one or more of the SERVQUAL items will normally signal the existence of an underlying opportunity whereas deficient scores indicate the existence of an underlying problem in the organization. Therefore, one of SERVQUAL's major contributions to the practise of management in the European nylon intermediates industry is its ability to identify symptoms and to provide a starting point for the examination of underlying opportunities respectively problems in the process of customer service quality.

The measurement of customer expectations as well as perceptions provides another valuable insight into the usefulness of the study's implication for the practise of

management. Lanxess for example should understand the items in which customers' expectations are particularly high so that the delivery process can be tailored to best meet those expectations (Parasuraman et al. 1985). The analysis might point - vice versa - to items where expectations are relatively low but on which the company already overachieves the desired level. In that case, it can be evaluated whether to reduce resources on such particular items or whether there could be the opportunity to positively influence customers' expectations on those items to get a higher expectation rating to then create differentiation opportunities in the market. For practical purposes, the instrument should therefore be used consistently on a regular basis to measure a company's performance over time and to track whether certain activities have contributed to changes in the customers' perception of the service quality delivered. In order to identify and correct service quality problems promptly, companies should understand customers' perception of customer service quality delivered and the relation in which expectations and perceptions are balanced.

Positive implications for the practise of management of the chosen approach therefore include the high practicability of the instrument which allows for a straight forward implementation in a chosen business setting. Moreover, introducing SERVQUAL to an organisation will create awareness for the topic of service quality among stakeholders. The coordination of such research and the agreement on both the questionnaire and the selection of participating customers involve various people within an enterprise thereby pointing individuals to the importance of service quality.

Once conducted and analysed, the results allow for a convenient interpretation. Particularly the analysis between expected level of service, perceived service level of the company under investigation and the comparison with competition is readily

comprehensible. Results can be presented graphically which further fosters a quick understanding.

The items of the SERVQUAL battery direct towards particular questions such as "Willingness to help customers" so that the enterprise could then further investigate those items to gain a deeper understanding on the underlying causes of a particular rating. Therefore, SERVQUAL offers the opportunity to realize which areas of the service quality process require more in depth analysis to ultimately maximize the opportunities attached to service quality.

SERVQUAL is a highly structured approach that produces structured feedback which leans itself towards regular application to measure service quality over time. Institutionalized as an annual tracker study the instrument allows a company to first gain a solid understanding of the general customers' service expectation and the perception of the company's performances. Based on the initial results, action plans can be derived to address certain areas that possess room for improvement or to optimize the value of those areas the companies exceeds expectations on. Applying the SERVQUAL tool regularly will then give the opportunity to measure performance over time and to the assess the effectiveness of certain activities thereby sensitising management for the topic of service quality and continuously giving impulses for optimizing service quality within the organisation.

However it suggested that managers in the nylon intermediates industry are cautious in interpreting results of SERVQUAL studies based upon the five-dimension model. Although the results indicate consistent score reliability across the study, the validity

of SERVQUAL within the industry, in its current form, is questionable. It appears that SERVQUAL is not as generic as Parasuraman et al. (1994) profess it to be.

5.4 Reflections

While the research objectives have been achieved, retrospectively there have been various challenges during the course of the research which on the one hand prolonged the previously estimated time for the research but on the other hand contributed to an enriching, continuous learning process.

Research takes time – this is a key learning from the research process. There are various factors impacting this finding both personally driven but also externally caused and hence, hardly influenceable by the researcher.

Keeping an appropriate balance between professional life and academic work has proven a challenge especially when preparing for and conducting the in-depth expert interviews but also during the actual drop-and-collect phase of the research. The analysis of the research results was also a fairly time consuming and intellectually intense part of this project. The hardware change from Windows to Apple has further added to the complexity of analysing the data and resulted in a considerable amount of additional work due to transferring data from one system to the other. Every researcher is therefore suggested to complete such work on one chosen system.

Generally, a systematic approach is needed to handle a complex thesis while also maintaining fully focused on the professional life. Such a structured approach was used in this research which outlined by quarter which steps needed to be done. At various times the researcher was forced to deviate from the original time plan due to urgent business matters but the plan was broadly followed from a structural point of view. Ultimately, setting personal deadlines is crucial to ensure the work is done in a timely manner.

But not only professional commitments resulted in slight adjustments of the research plan but also external factors contributed to certain shifts. While the drop and collect technique possesses numerous advantages as outlined in Chapter 3.1, the researcher ultimately relies on the active and willing collaboration of the chosen participants. It is not in the hands of the researcher to accelerate the subjects' response time.

But overall a research process will only prove successful and enrich one's knowledge and intellect if one is personally and intrinsically motivated to carry out such a complex yet challenging project. The experiences gained while conducting the research by enlarging theoretical knowledge, applying well researched concepts, collaborating with various people such as the expert panels, analysing collected data but also through attending the peer review courses have greatly enriched the personal ken of the researcher. So while the research adds to the general practice of theory and management it has also formed the researcher's character.

Furthermore, the support of colleagues, academic peers and family has had a constant positive effect on the researcher's motivation. Finally, the exchange with the

academic supervisor has always been a great source of new inspiration and essential guidance.

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APPENDIX A – QUESTIONNAIRE AND CODING

Customer Service Quality Questionnaire

Dear Lanxess Nylon-Intermediates Customer,

To ensure that service levels at Lanxess are always kept at a high standard, this study has been designed to obtain your opinion of the quality of service provided to you by the customer service of Lanxess. This study is being conducted in collaboration with the Bradford School of Management and focuses on the nylon intermediate industry, ranging from adipic acid and caprolactam to glass fibre. The results of this survey will benefit both you and the Lanxess customer service. In today's competitive environment, it is essential to get your feedback so we can provide the best customer service possible.

Your time is valuable, so the study has been designed to take no more than 15 minutes. Your answers to the following questions are very important for the success of the study. All information will remain confidential.

Your participation is voluntary and highly appreciated. You may withdraw from the study at any time or omit answering any of the questions. All information will be coded, remain confidential and will not be linked to any individual or company.

If you have any questions while filling out this questionnaire, please contact me at any time.

Thank you for your time and effort in completing the survey.

Sincerly,

Jens-H. Fischer

January 2009

Part A

Your voluntary participation is highly appreciated. All information will remain confidential.

Instructions: The below questions serve as background information of your company.

Please answer the questions by marking the respective boxes.

1. Please indicate your company's size in terms of employees.

   ☐ up to 50 ☐ 51-200 ☐ 201-500 ☐ above 500

2. Please indicate the department you are working for and your specific job title.

   ☐ General Management
   ☐ Procurement
   ☐ Production
   ☐ Marketing
   ☐ Sales

   Job Title: _____

3. How long have you had business relations with Lanxess?

   ☐ less than 1 year ☐ 1-5 years ☐ more than 5 years

4. Please specify how often you deal (telephone, email, etc.) with Lanxess.

   ☐ daily ☐ weekly ☐ monthly ☐ quarterly

5. Please indicate the number of companies you deal with that are similar to Lanxess.

   ☐ up to 2 ☐ 3-5 ☐ 6-10 ☐ above 10

6. Please specify how often you deal with those companies (on average).

   ☐ daily ☐ weekly ☐ monthly ☐ quarterly

7. Please name the company which in your opinion offers the best customer service.

   _____

Part B

Instructions: The survey's objective is to find to what extend Lanxess' customer service meets your expectations. Service quality can be defined as "the customer's assessment of the overall excellence of the service."

For each of the following statements, please indicate:

A your minimum service level by ticking one of the numbers in Column A.

MINIMUM SERVICE LEVEL - the minimum level of service performance you would consider acceptable

B your desired servicel level by ticking one of the numbers in Column B. This score will be equal to or higher than Column A.

DESIRED SERVICE LEVEL - the level of service performance you believe an excellent customer service can and should deliver

C your rating of Lanxess' customer service by ticking one of the numbers in Column C.

Please rate each statement on customer service quality using the scales provided on the next pages. If you feel the level is extremely poor, circle the number "1". If you feel it is extremely good, please circle the number "7". If your feelings are in between, please circle the appropriate number. There is an example on the next page for further clarification.

There are no right or wrong answers - the objective is to obtain ratings on each statement that best represent your minimum service level, desired service level, and perception of the Lanxess' customer service performance.

EXAMPLE: Below, please find an example using the shipping industry. The desired level should be the same as or higher than the minimum level.

Note: "N" = no opinion "1" = extremely poor "7" = extremely good

When it comes to:	Column A My minimum service level is:	Column B My desired service level is:	Column C I think customer service at Beluga Shipping is:
1. Performing services right at the first time	low ☐ ☐ ☐ ☑ ☐ ☐ ☐ high 1 2 3 4 5 6 7	low ☐ ☐ ☐ ☐ ☐ ☑ ☐ high 1 2 3 4 5 6 7	low ☐ ☐ ☐ ☐ ☐ ☐ ☑ ☐ high 1 2 3 4 5 6 7 N
2. Willingness to help customers	low ☐ ☐ ☐ ☐ ☑ ☐ ☐ high 1 2 3 4 5 6 7	low ☐ ☐ ☐ ☐ ☐ ☑ ☐ high 1 2 3 4 5 6 7	low ☐ ☐ ☐ ☐ ☐ ☑ ☐ ☐ high 1 2 3 4 5 6 7 N
3. Making customers feel safe in their transactions	low ☐ ☑ ☐ ☐ ☐ ☐ ☐ high 1 2 3 4 5 6 7	low ☐ ☐ ☐ ☑ ☐ ☐ ☐ high 1 2 3 4 5 6 7	low ☐ ☐ ☑ ☐ ☐ ☐ ☐ ☐ high 1 2 3 4 5 6 7 N

NOW, please share your opinion by rating your minimum and desired service levels as well as the Lanxess customer service level through ticking a number in each column.

Note: "N" = no opinion "1" = extremely poor "7" = extremely good

When it comes to:	Column A My minimum service level is:	Column B My desired service level is:	Column C I think the Lanxess customer service level is:
1. Providing customer service as promised	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐☐ 1 2 3 4 5 6 7 N
2. Dependability in handling customers' service problems	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐☐ 1 2 3 4 5 6 7 N
3. Performing customer service right the first time	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐☐ 1 2 3 4 5 6 7 N
4. Providing customer service at the promised time	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐☐ 1 2 3 4 5 6 7 N
5. Maintaining error-free records	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐☐ 1 2 3 4 5 6 7 N
6. Keeping customers informed about when customer service will be provided	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐☐ 1 2 3 4 5 6 7 N

Note: "N" = no opinion "1" = extremely poor "7" = extremely good

When it comes to:	Column A My minimum service level is:	Column B My desired service level is:	Column C I think the Lanxess customer service level is:
7. Prompt customer service	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ ☐ 1 2 3 4 5 6 7 N
8. Willingness to help customers	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ ☐ 1 2 3 4 5 6 7 N
9. Ability to respond to customer's request	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ ☐ 1 2 3 4 5 6 7 N
10. Employees who instill confidence in customers	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ ☐ 1 2 3 4 5 6 7 N
11. Making customers feel safe in their transactions	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ ☐ 1 2 3 4 5 6 7 N
12. Employees who are consistently courteous	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ ☐ 1 2 3 4 5 6 7 N
13. Employees who have the knowledge to answer customer questions	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ ☐ 1 2 3 4 5 6 7 N

Note: "N" = no opinion "1" = extremely poor "7" = extremely good

When it comes to:	Column A My minimum service level is:	Column B My desired service level is:	Column C I think the Lanxess customer service level is:
14. Giving customers individual attention	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐☐ 1 2 3 4 5 6 7 N
15. Employees who deal with customers in caring fashion	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐☐ 1 2 3 4 5 6 7 N
16. Having the customer's best interests at heart	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐☐ 1 2 3 4 5 6 7 N
17. Employees who understand the needs of their customers	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐☐ 1 2 3 4 5 6 7 N
18. Convenient business hours	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐☐ 1 2 3 4 5 6 7 N
19. Modern equipment (e.g. trucks, SAP)	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐☐ 1 2 3 4 5 6 7 N
20. Visually appealing offices	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐☐ 1 2 3 4 5 6 7 N

Note: "N" = no opinion "1" = extremely poor "7" = extremely good

When it comes to:	Column A My minimum service level is:	Column B My desired service level is:	Column C I think the Lanxess customer service level is:
21. Sales persons who have a neat, professional appearance	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐☐ 1 2 3 4 5 6 7 N
22. Visually appealing materials associated with service (e.g. Certificates of Analysis, order confirmation)	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐ 1 2 3 4 5 6 7	low high ☐☐☐☐☐☐☐☐ 1 2 3 4 5 6 7 N

23.

PLEASE RATE the overall service quality of Lanxess' customer service on the scale provided below. If you feel the overall customer service quality is extremely poor, tick the number "1". If you feel it is extremely good, please tick the number "7". If your feelings are in between, please tick the appropriate number.

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ no opinion

Once again, all data will remain confidential. Thank you very much for your participation.

Best regards,

Jens-H. Fischer

Name	Label
PromiseM	Minimun: Providing customer service as promised
PromiseD	Desired: Providing customer service as promised
PromiseL	LANXESS: Providing customer servie as promised
DependM	Minimun: Dependability in handling customers' service problems
DependD	Desired: Dependability in handling customers' service problems
DependL	LANXESS: Dependability in handling customers' service problems
FrsttimeM	Minimum: Performing customer service right the first time
FrsttimeD	Desired: Performing customer service right the first time
FrsttimeL	Lanxess: Performing customer service right the first time
PrsdtimeM	Minimum: Providing customer service at the promised time
PrsdtimeD	Desired: Providing customer service at the promised time
PrsdtimeL	LANXESS: Providing customer service at the promised time
RecordsM	Minimum: Maintaining error-free records
RecordsD	Desired: Maintaining error-free records
RecordsL	LANXESS: Maintaining error-free records
InformM	Minimum: Keeping customers informed about when customer service will be provided
InformD	Desired: Keeping customers informed about when customer service will be provided
InformL	LANXESS: Keeping customers informed about when customer service will be provided
PromptM	Minimum: Prompt customer service
PromptD	Desired: Prompt customer service
PromptL	LANXESS: Prompt customer service
WillingM	Minimum: Willingness to help customers
WillingD	Desired: Willingness to help customers
WillingL	LANXESS: Willingness to help customers
RespondM	Minimum: Ability to respond to customer's request
RespondD	Desired: Ability to respond to customer's request
RespondL	LANXESS: Ability to respond to customer's request
ConfM	Minimum: Employees who instill confidence in customers
ConfD	Desired: Employees who instill confidence in customers
ConfL	LANXESS: Employees who instill confidence in customers
SafeM	Minimum: Making customers feel safe in their transactions
SafeD	Desired: Making customers feel safe in their transactions
SafeL	LANXESS: Making customers feel safe in their transactions
CourtM	Minimum: who are consistently courteous
CourtD	Desired: Employees who are consistently courteous
CourtL	LANXESS: Employees who are consistently courteous
KnowM	Minimum: Employees who have the knowledge to answer customer questions
KnowD	Desired: Employees who have the knowledge to answer customer questions
KnowL	LANXESS: Employees who have the knowledge to answer customer questions
AttentM	Minimum: Giving customers individual attention
AttentD	Desired: Giving customers individual attention
AttentL	LANXESS: Giving customers individual attention
CareM	Minimum: Employees who deal with customers in caring fashion
CareD	Desired: Employees who deal with customers in caring fashion
CareL	LANXESS: Employees who deal with customers in caring fashion
InterestM	Minimum: Having the customer's best interests at heart
InterestD	Desired: Having the customer's best interests at heart
InterestL	LANXESS: Having the customer's best interests at heart
NeedsM	Minimum: Employees who understand the needs of their customers
NeedsD	Desired: Employees who understand the needs of their customers
NeedsL	LANXESS: Employees who understand the needs of their customers
HoursM	Minimum: Convenient business hours
HoursD	Desired: Convenient business hours
HoursL	LANXESS: Convenient business hours
ModernM	Minimum: Modern equipment (e.g. trucks, SAP)
ModernD	Desired: Modern equipment (e.g. trucks, SAP)
ModernL	LANXESS: Modern equipment (e.g. trucks, SAP)
OfficesM	Minimum: Visually appealing offices
OfficesD	Desired: Visually appealing offices
OfficesL	LANXESS: Visually appealing offices
AppearM	Minimum: Sales persons who have a neat, professional appearance
AppearD	Desired: Sales persons who have a neat, professional appearance
AppearL	LANXESS: Sales persons who have a neat, professional appearance
MaterialsM	Minimum: Visually appealing materials associated with service
MaterialsD	Desired: Visually appealing materials associated with service
MaterialsL	LANXESS: Visually appealing materials associated with service

TABLE 26: CODING OF SERVQUAL DATA

APPENDIX B – CORRELATION MATRICES

Correlation Matrix

		E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16	E17	E18	E19	E20	E21	E22
Correlation	E1	1,000	,555	,562	,429	,165	,350	,342	,251	,227	,057	,142	,132	,231	,206	,193	,172	,353	,147	,231	,198	,060	,121
	E2	,555	1,000	,485	,387	,106	,463	,372	,317	,256	,115	,033	,180	,310	,288	,333	,154	,349	,248	,186	,204	,146	,166
	E3	,562	,485	1,000	,545	,216	,336	,377	,064	,218	,142	,147	,076	,223	,244	,254	,290	,220	,430	,334	,196	,078	,090
	E4	,429	,387	,545	1,000	,392	,300	,397	,182	,263	,165	,264	,196	,193	,181	,109	,324	,301	,507	,462	,209	,184	,182
	E5	,165	,106	,216	,392	1,000	,390	,333	,255	,297	,454	,549	,567	,255	,180	,211	,307	,202	,549	,529	,407	,346	,536
	E6	,350	,463	,336	,300	,390	1,000	,443	,200	,401	,386	,385	,299	,350	,325	,353	,208	,380	,239	,314	,353	,350	,482
	E7	,342	,372	,377	,397	,333	,443	1,000	,510	,431	,401	,386	,420	,386	,471	,383	,245	,356	,445	,331	,277	,282	,285
	E8	,251	,317	,064	,182	,255	,200	,510	1,000	,380	,463	,307	,499	,426	,382	,335	,363	,323	,328	,242	,295	,378	,295
	E9	,227	,256	,218	,263	,297	,401	,431	,380	1,000	,398	,410	,412	,482	,479	,422	,380	,347	,338	,395	,343	,193	,327
	E10	,057	,115	,142	,165	,454	,386	,401	,463	,398	1,000	,626	,571	,242	,413	,326	,406	,276	,512	,494	,451	,504	,513
	E11	,142	,033	,147	,264	,549	,385	,386	,307	,410	,626	1,000	,541	,286	,414	,375	,337	,306	,386	,516	,460	,353	,531
	E12	,132	,180	,076	,196	,567	,299	,420	,499	,412	,571	,541	1,000	,308	,297	,462	,497	,223	,468	,459	,469	,456	,551
	E13	,231	,310	,223	,193	,255	,350	,386	,426	,482	,242	,286	,308	1,000	,487	,416	,407	,253	,114	,245	,107	,138	,159
	E14	,206	,288	,244	,181	,180	,325	,471	,382	,479	,413	,414	,297	,487	1,000	,552	,415	,286	,339	,349	,361	,260	,235
	E15	,193	,333	,254	,109	,211	,353	,383	,335	,422	,326	,375	,462	,416	,552	1,000	,529	,348	,237	,311	,432	,299	,367
	E16	,172	,154	,290	,324	,307	,208	,245	,363	,380	,406	,337	,497	,407	,415	,529	1,000	,381	,423	,501	,484	,423	,350
	E17	,353	,349	,220	,301	,202	,380	,356	,323	,347	,276	,306	,223	,253	,286	,348	,381	1,000	,151	,235	,356	,296	,378
	E18	,147	,248	,430	,507	,549	,239	,445	,328	,338	,512	,386	,468	,114	,339	,237	,423	,151	1,000	,665	,456	,492	,391
	E19	,231	,186	,334	,462	,529	,314	,331	,242	,395	,494	,516	,459	,245	,349	,311	,501	,235	,665	1,000	,595	,478	,457
	E20	,198	,204	,196	,209	,407	,353	,277	,295	,343	,451	,460	,469	,107	,361	,432	,484	,356	,456	,595	1,000	,682	,491
	E21	,060	,146	,078	,184	,346	,350	,282	,378	,193	,504	,353	,456	,138	,260	,299	,423	,296	,492	,478	,682	1,000	,609
	E22	,121	,166	,090	,182	,536	,482	,285	,295	,327	,513	,531	,551	,159	,235	,367	,350	,378	,391	,457	,491	,609	1,000

TABLE 27: CORRELATION MATRIX OF DESIRED SCORES (E)

Correlation Matrix

		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	P22
Correlation	P1	1,000	,669	,655	,609	,403	,504	,543	,395	,456	,334	,425	,398	,460	,432	,468	,514	,514	,393	,400	,272	,380	,504
	P2	,669	1,000	,616	,552	,380	,557	,491	,418	,341	,339	,426	,412	,437	,486	,493	,398	,433	,388	,365	,199	,392	,453
	P3	,655	,616	1,000	,558	,312	,478	,498	,372	,447	,402	,501	,389	,357	,474	,484	,431	,337	,433	,373	,326	,411	,410
	P4	,609	,552	,558	1,000	,435	,529	,494	,309	,394	,324	,358	,358	,425	,460	,493	,455	,378	,377	,220	,180	,256	,310
	P5	,403	,380	,312	,435	1,000	,564	,455	,378	,422	,339	,486	,506	,542	,378	,377	,357	,478	,157	,128	,081	,180	,354
	P6	,504	,557	,478	,529	,564	1,000	,589	,512	,284	,279	,390	,477	,369	,391	,474	,311	,423	,347	,201	,093	,223	,393
	P7	,543	,491	,498	,494	,455	,589	1,000	,560	,455	,403	,416	,494	,377	,619	,527	,352	,436	,474	,357	,211	,421	,363
	P8	,395	,418	,372	,309	,378	,512	,560	1,000	,466	,500	,477	,509	,367	,252	,419	,320	,398	,391	,363	,144	,456	,440
	P9	,456	,341	,447	,394	,422	,284	,455	,466	1,000	,508	,420	,559	,400	,421	,463	,458	,412	,368	,389	,106	,353	,397
	P10	,334	,339	,402	,324	,339	,279	,403	,500	,508	1,000	,681	,484	,399	,441	,436	,490	,429	,457	,439	,306	,531	,403
	P11	,425	,426	,501	,358	,486	,390	,416	,477	,420	,681	1,000	,499	,546	,420	,473	,482	,453	,332	,434	,306	,434	,408
	P12	,398	,412	,389	,358	,506	,477	,494	,509	,559	,484	,499	1,000	,424	,460	,462	,375	,398	,422	,301	,282	,474	,519
	P13	,460	,437	,357	,425	,542	,369	,377	,367	,400	,399	,546	,424	1,000	,503	,488	,471	,491	,323	,346	,141	,274	,488
	P14	,432	,486	,474	,460	,378	,391	,619	,252	,421	,441	,420	,460	,503	1,000	,613	,511	,467	,436	,331	,269	,349	,412
	P15	,468	,493	,484	,493	,377	,474	,527	,419	,463	,436	,473	,462	,488	,613	1,000	,591	,567	,436	,346	,243	,410	,476
	P16	,514	,398	,431	,455	,357	,311	,352	,320	,458	,490	,482	,375	,471	,511	,591	1,000	,615	,350	,324	,218	,316	,438
	P17	,514	,433	,337	,378	,478	,423	,436	,398	,412	,429	,453	,398	,491	,467	,567	,615	1,000	,289	,260	,077	,259	,465
	P18	,393	,388	,433	,377	,157	,347	,474	,391	,368	,457	,332	,422	,323	,436	,436	,350	,289	1,000	,556	,235	,432	,426
	P19	,400	,365	,373	,220	,128	,201	,357	,363	,389	,439	,434	,301	,346	,331	,346	,324	,260	,556	1,000	,481	,564	,534
	P20	,272	,199	,326	,180	,081	,093	,211	,144	,106	,306	,306	,282	,141	,269	,243	,218	,077	,235	,481	1,000	,455	,300
	P21	,380	,392	,411	,256	,180	,223	,421	,456	,353	,531	,434	,474	,274	,349	,410	,316	,259	,432	,564	,455	1,000	,477
	P22	,504	,453	,410	,310	,354	,393	,363	,440	,397	,403	,408	,519	,488	,412	,476	,438	,465	,426	,534	,300	,477	1,000

TABLE 28: CORRELATION MATRIX OF PERCEIVED SCORES (P)

Correlation Matrix

		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22
Correlation	Q1	1,000	**,684**	**,508**	**,564**	**,386**	**,394**	**,431**	,274	,297	,199	,288	,060	,290	**,457**	**,388**	,234	**,399**	,126	,012	-,052	,193	,165
	Q2	**,684**	1,000	**,599**	**,535**	**,317**	**,461**	**,456**	**,307**	**,318**	**,377**	**,306**	,229	,299	**,521**	**,470**	**,379**	**,442**	**,371**	,274	,123	**,388**	,266
	Q3	**,508**	**,599**	1,000	**,520**	,291	**,466**	**,419**	**,325**	**,314**	,263	,273	,168	,229	**,344**	**,400**	**,328**	**,360**	,274	,189	,000	,223	,151
	Q4	**,564**	**,535**	**,520**	1,000	**,557**	**,566**	**,435**	,290	,286	**,371**	**,397**	,187	**,315**	**,398**	**,317**	,288	**,472**	**,397**	,188	,109	,273	,196
	Q5	**,386**	**,317**	,291	**,557**	1,000	**,426**	**,499**	,161	,064	,162	**,430**	,260	**,326**	,283	,216	,279	**,331**	**,404**	,295	,105	,136	,197
	Q6	**,394**	**,461**	**,466**	**,566**	**,426**	1,000	**,550**	,296	**,304**	**,339**	**,482**	,204	,291	**,417**	**,462**	**,339**	**,478**	**,378**	,267	,162	**,363**	**,348**
	Q7	**,431**	**,456**	**,419**	**,435**	**,499**	**,550**	1,000	**,342**	**,312**	,266	**,404**	**,388**	**,366**	**,408**	**,317**	,267	**,400**	**,358**	**,325**	,175	**,379**	**,404**
	Q8	,274	**,307**	**,325**	,290	,161	,296	**,342**	1,000	**,326**	**,360**	,288	**,334**	**,371**	,253	,227	,290	**,378**	,205	,126	,113	,185	,102
	Q9	,297	**,318**	**,314**	,286	,064	**,304**	**,312**	**,326**	1,000	,232	,218	,167	**,302**	,179	,255	,241	,206	,157	,182	,111	,183	,179
	Q10	,199	**,377**	,263	**,371**	,162	**,339**	,266	**,360**	,232	1,000	**,435**	**,324**	,147	**,335**	,239	,206	**,341**	**,319**	,266	**,318**	**,412**	,289
	Q11	,288	**,306**	,273	**,397**	**,430**	**,482**	**,404**	,288	,218	**,435**	1,000	**,368**	**,427**	,242	**,335**	,285	**,342**	,269	,274	,266	,224	,235
	Q12	,060	,229	,168	,187	,260	,204	**,388**	**,334**	,167	**,324**	**,368**	1,000	,215	**,304**	**,302**	,225	,181	**,542**	**,445**	**,450**	**,533**	**,357**
	Q13	,290	,299	,229	**,315**	**,326**	,291	**,366**	**,371**	**,302**	,147	**,427**	,215	1,000	,277	,220	,294	**,365**	,132	,088	-,059	,026	,114
	Q14	**,457**	**,521**	**,344**	**,398**	,283	**,417**	**,408**	,253	,179	**,335**	,242	**,304**	,277	1,000	**,323**	**,478**	**,449**	**,382**	,251	,152	**,350**	,229
	Q15	**,388**	**,470**	**,400**	**,317**	,216	**,462**	**,317**	,227	,255	,239	**,335**	**,302**	,220	**,323**	1,000	**,422**	,258	**,308**	,227	**,332**	**,336**	**,398**
	Q16	,234	**,379**	**,328**	,288	,279	**,339**	,267	,290	,241	,206	,285	,225	,294	**,478**	**,422**	1,000	**,499**	**,381**	**,310**	,293	**,324**	,290
	Q17	**,399**	**,442**	**,360**	**,472**	**,331**	**,478**	**,400**	**,378**	,206	**,341**	**,342**	,181	**,365**	**,449**	,258	**,499**	1,000	**,354**	,271	,120	**,392**	,292
	Q18	,126	**,371**	,274	**,397**	**,404**	**,378**	**,358**	,205	,157	**,319**	,269	**,542**	,132	**,382**	**,308**	**,381**	**,354**	1,000	**,616**	**,383**	**,496**	**,461**
	Q19	,012	,274	,189	,188	,295	,267	**,325**	,126	,182	,266	,274	**,445**	,088	,251	,227	**,310**	,271	**,616**	1,000	**,481**	**,481**	**,450**
	Q20	-,052	,123	,000	,109	,105	,162	,175	,113	,111	**,318**	,266	**,450**	-,059	,152	**,332**	,293	,120	**,383**	**,481**	1,000	**,536**	**,360**
	Q21	,193	**,388**	,223	,273	,136	**,363**	**,379**	,185	,183	**,412**	,224	**,533**	,026	**,350**	**,336**	**,324**	**,392**	**,496**	**,481**	**,536**	1,000	**,522**
	Q22	,165	,266	,151	,196	,197	**,348**	**,404**	,102	,179	,289	,235	**,357**	,114	,229	**,398**	,290	,292	**,461**	**,450**	**,360**	**,522**	1,000

TABLE 29: CORRELATION MATRIX OF GAP SCORES (MSS)

Correlation Matrix

		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22
Correlation	Q1	1,000	,566	,356	,366	,251	,355	,451	,314	,319	,281	,222	,180	,286	,230	,242	,196	,317	,164	,027	,148	,247	,099
	Q2	,566	1,000	,450	,439	,199	,261	,385	,363	,235	,304	,140	,314	,257	,286	,269	,352	,349	,250	,217	,064	,250	,099
	Q3	,356	,450	1,000	,374	,223	,420	,351	,292	,342	,120	,266	,151	,254	,211	,284	,253	,272	,183	,290	,060	,095	,102
	Q4	,366	,439	,374	1,000	,449	,376	,392	,323	,132	,261	,281	,243	,269	,220	,203	,284	,330	,233	,193	-,046	,020	-,007
	Q5	,251	,199	,223	,449	1,000	,279	,359	,256	,148	,113	,102	,252	,246	,147	,097	,216	,192	,369	,266	,037	,038	,119
	Q6	,355	,261	,420	,376	,279	1,000	,553	,444	,236	,302	,378	,291	,226	,383	,349	,374	,318	,294	,268	,140	,231	,323
	Q7	,451	,385	,351	,392	,359	,553	1,000	,503	,289	,306	,417	,429	,312	,370	,291	,371	,274	,356	,315	,245	,305	,296
	Q8	,314	,363	,292	,323	,256	,444	,503	1,000	,322	,326	,293	,419	,555	,415	,303	,403	,407	,210	,312	,151	,251	,231
	Q9	,319	,235	,342	,132	,148	,236	,289	,322	1,000	,240	,311	,359	,415	,362	,390	,363	,370	,252	,323	,230	,212	,256
	Q10	,281	,304	,120	,261	,113	,302	,306	,326	,240	1,000	,456	,302	,298	,370	,264	,315	,287	,220	,263	,271	,347	,375
	Q11	,222	,140	,266	,281	,102	,378	,417	,293	,311	,456	1,000	,419	,467	,440	,282	,383	,215	,213	,434	,244	,306	,290
	Q12	,180	,314	,151	,243	,252	,291	,429	,419	,359	,302	,419	1,000	,310	,538	,383	,423	,286	,480	,487	,479	,490	,490
	Q13	,286	,257	,254	,269	,246	,226	,312	,555	,415	,298	,467	,310	1,000	,401	,363	,452	,521	,164	,273	,190	,150	,218
	Q14	,230	,286	,211	,220	,147	,383	,370	,415	,362	,370	,440	,538	,401	1,000	,507	,538	,519	,364	,271	,401	,323	,448
	Q15	,242	,269	,284	,203	,097	,349	,291	,303	,390	,264	,282	,383	,363	,507	1,000	,493	,318	,330	,342	,382	,349	,389
	Q16	,196	,352	,253	,284	,216	,374	,371	,403	,363	,315	,383	,423	,452	,538	,493	1,000	,610	,428	,393	,313	,408	,421
	Q17	,317	,349	,272	,330	,192	,318	,274	,407	,370	,287	,215	,286	,521	,519	,318	,610	1,000	,232	,204	,265	,247	,308
	Q18	,164	,250	,183	,233	,369	,294	,356	,210	,252	,220	,213	,480	,164	,364	,330	,428	,232	1,000	,517	,337	,305	,357
	Q19	,027	,217	,290	,193	,266	,268	,315	,312	,323	,263	,434	,487	,273	,271	,342	,393	,204	,517	1,000	,427	,493	,419
	Q20	,148	,064	,060	-,046	,037	,140	,245	,151	,230	,271	,244	,479	,190	,401	,382	,313	,265	,337	,427	1,000	,586	,557
	Q21	,247	,250	,095	,020	,038	,231	,305	,251	,212	,347	,306	,490	,150	,323	,349	,408	,247	,305	,493	,586	1,000	,515
	Q22	,099	,099	,102	-,007	,119	,323	,296	,231	,256	,375	,290	,490	,218	,448	,389	,421	,308	,357	,419	,557	,515	1,000

TABLE 30: CORRELATION MATRIX OF GAP SCORES (MSA)

APPENDIX C – SCREE PLOTS

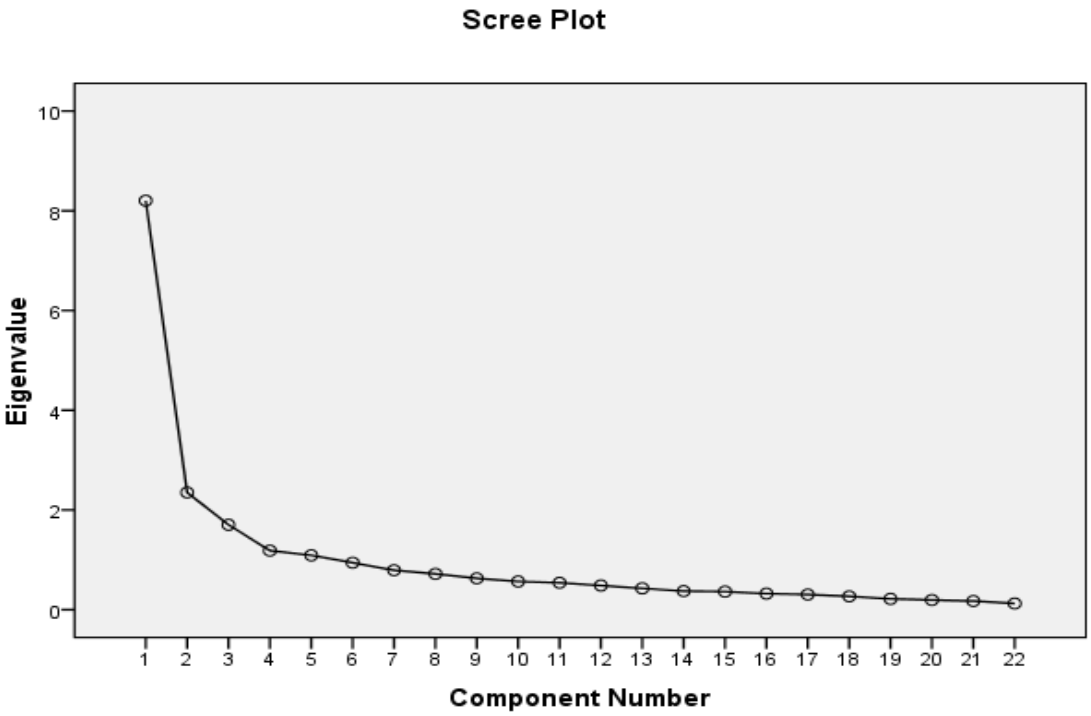

FIGURE 19: SCREE PLOT OF DESIRED SCORES

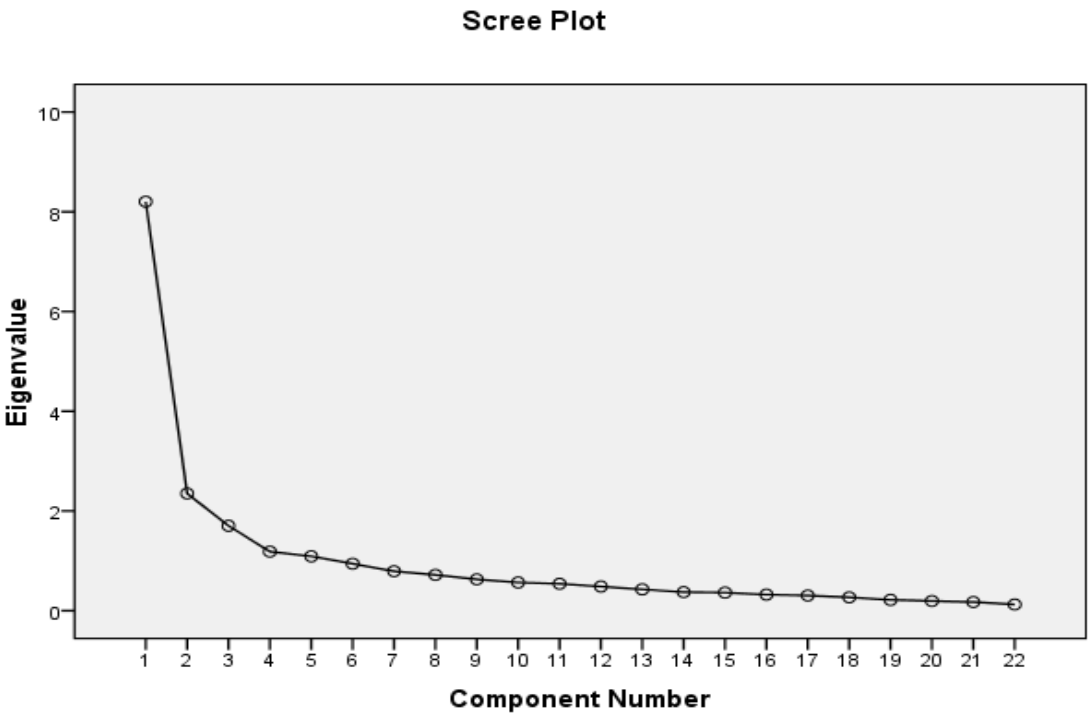

FIGURE 20: SCREE PLOT OF PERCEIVED SCORES

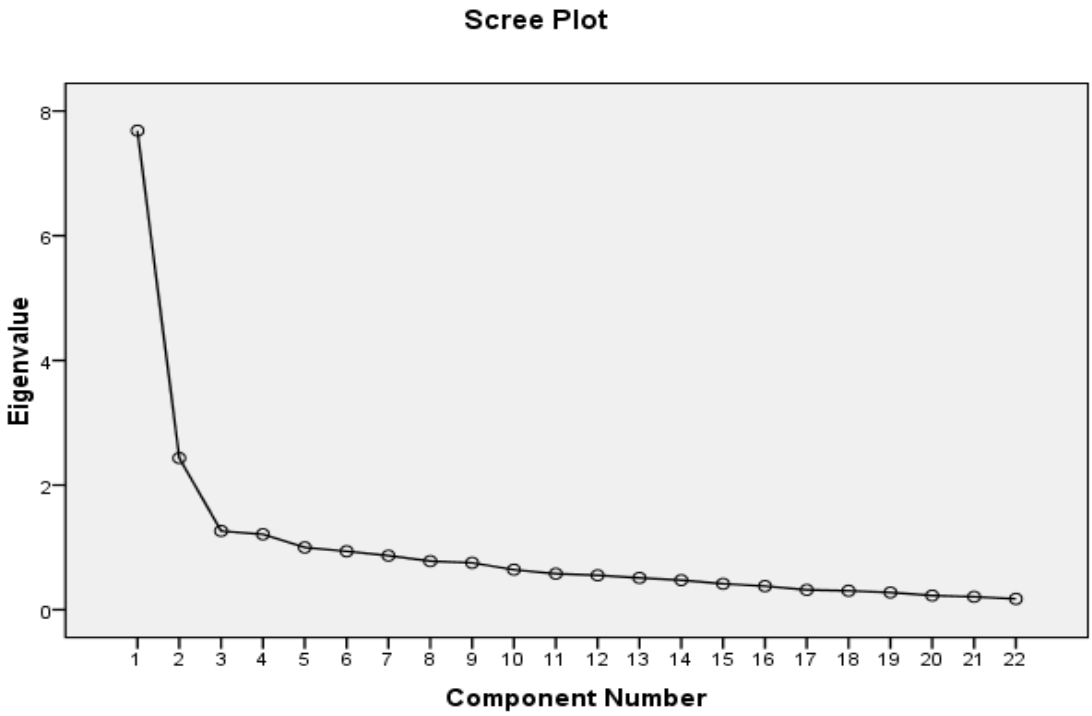

FIGURE 21: SCREE PLOT OF MSS SCORES

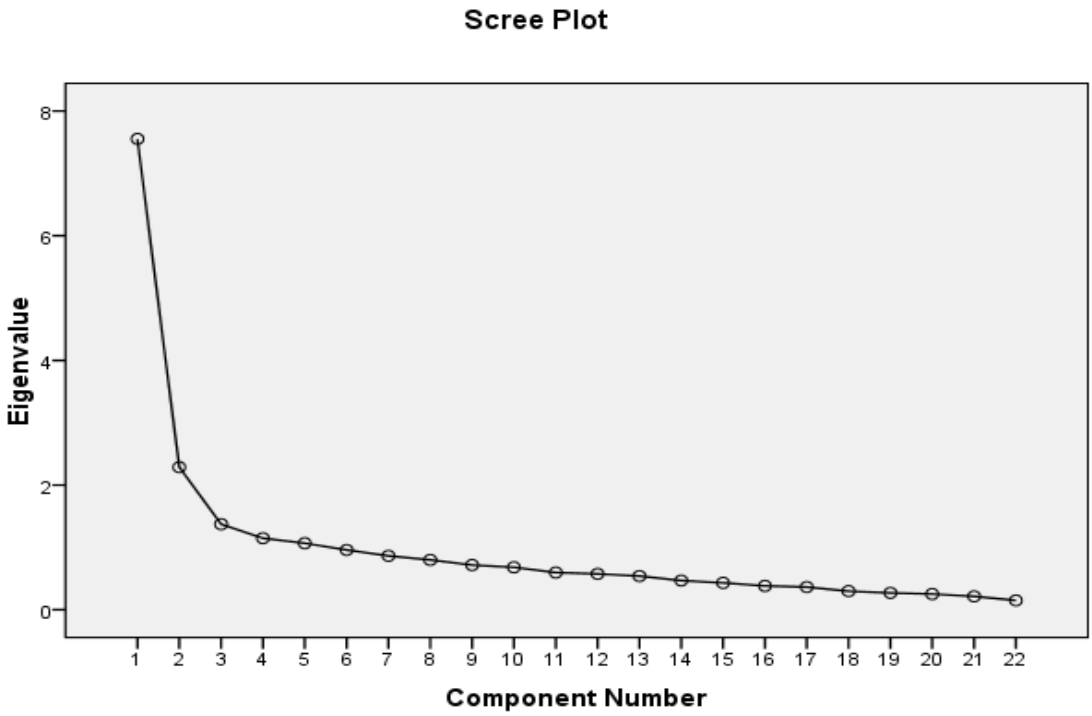

FIGURE 22: SCREE PLOT OF MSA SCORES

APPENDIX D – COMPONENT MATRICES

Component Matrix[a]

	Component				
	1	2	3	4	5
Modern equipment (e.g. trucks, SAP)	,715		,347		
Employees who are consistently courteous	,705	-,329			
Employees who instill confidence in customers	,695	-,355			
Visually appealing offices	,680				,340
Making customers feel safe in their transactions	,679				
Convenient business hours	,678		,437	-,309	
Visually appealing materials associated with service	,659	-,355		,376	
Prompt customer service	,657				
Having the customer's best interests at heart	,651				,508
Maintaining error-free records	,634		,323		-,348
Ability to respond to customer's request	,630				
Sales persons who have a neat, professional appearance	,622	-,387		,343	
Employees who deal with customers in caring fashion	,618		-,414		
Keeping customers informed	,611			,368	-,344
Giving customers individual attention	,610		-,406		
Willingness to help customers	,583		-,349		
Employees who understand the needs of their customers	,531			,439	
Providing customer service at the promised time	,513	,394	,494		
Knowledgeable employees	,509		-,489		
Dependability in handling customers' service problems	,455	,630			
Performing customer service right the first time	,450	,597	,374		
Providing customer service as promised	,412	,647			

Extraction Method: Principal Component Analysis.

a. 5 components extracted.

TABLE 31: COMPONENT MATRIX OF DESIRED SCORES (E)

Component Matrix[a]

	Component			
	1	2	3	4
Employees who deal with customers in caring fashion	,744			
Providing customer service as promised	,743		,353	
Prompt customer service	,729			
Making customers feel safe in their transactions	,713			
Dependability in handling customers' service problems	,711		,376	
Performing customer service right the first time	,709		,396	
Employees who are consistently courteous	,701			
Giving customers individual attention	,700			
Visually appealing materials associated with service	,683			
Employees who instill confidence in customers	,679		-,361	
Having the customer's best interests at heart	,676			-,486
Employees who understand the needs of their customers	,666			
Knowledgeable employees	,665			
Ability to respond to customer's request	,658			
Providing customer service at the promised time	,656	-,304	,351	
Keeping customers informed	,652	-,387		,365
Willingness to help customers	,650			,496
Convenient business hours	,616			
Sales persons who have a neat, professional appearance	,611	,529		
Maintaining error-free records	,602	-,440		
Modern equipment (e.g. trucks, SAP)	,584	,583		
Visually appealing offices	,380	,577		

Extraction Method: Principal Component Analysis.

a. 4 components extracted.

TABLE 32: COMPONENT MATRIX OF PERCEIVED SCORES (P)

Component Matrix[a]

	Component				
	1	2	3	4	5
Dependability in handling customers' service problems	,724		-,346		
Keeping customers informed	,714				
Prompt customer service	,699				
Providing customer service at the promised time	,689	-,327			
Employees who understand the needs of their customers	,657				-,391
Convenient business hours	,644	,411			
Giving customers individual attention	,634				-,357
Sales persons who have a neat, professional appearance	,612	,493			
Performing customer service right the first time	,608	-,361			
Employees who deal with customers in caring fashion	,601				
Making customers feel safe in their transactions	,599		,471		
Having the customer's best interests at heart	,591				-,594
Providing customer service as promised	,584	-,533			
Maintaining error-free records	,561			-,623	
Employees who instill confidence in customers	,552				
Employees who are consistently courteous	,544	,476			
Visually appealing materials associated with service	,535	,417			
Modern equipment (e.g. trucks, SAP)	,531	,542			
Willingness to help customers	,496		,353	,469	
Knowledgeable employees	,458	-,347	,527		
Ability to respond to customer's request	,435			,487	
Visually appealing offices	,398	,665			

Extraction Method: Principal Component Analysis.

a. 5 components extracted.

TABLE 33: COMPONENT MATRIX OF GAP SCORES (MSS)

Component Matrix[a]

	Component				
	1	2	3	4	5
Having the customer's best interests at heart	,718				
Giving customers individual attention	,701				
Employees who are consistently courteous	,693				
Prompt customer service	,669				
Willingness to help customers	,639				
Employees who deal with customers in caring fashion	,621				
Employees who understand the needs of their customers	,618		-,417		
Keeping customers informed	,608				
Modern equipment (e.g. trucks, SAP)	,605	-,301	,351		
Knowledgeable employees	,600		-,446	-,321	
Making customers feel safe in their transactions	,597				-,589
Visually appealing materials associated with service	,581	-,515			
Sales persons who have a neat, professional appearance	,566	-,473		,375	
Convenient business hours	,565		,461		
Ability to respond to customer's request	,555				
Employees who instill confidence in customers	,547				-,417
Dependability in handling customers' service problems	,538	,416		,399	
Visually appealing offices	,512	-,594			
Providing customer service as promised	,497	,442		,523	
Performing customer service right the first time	,477	,425			
Providing customer service at the promised time	,474	,566			
Maintaining error-free records	,392	,337	,480	-,383	

Extraction Method: Principal Component Analysis.

a. 5 components extracted.

TABLE 34: COMPONENT MATRIX OF GAP SCORES (MSA)

APPENDIX E – ROTATED COMPONENT MATRICES

Rotated Component Matrix[a]

	Component				
	1	2	3	4	5
Factor I (α = ,895)					
Maintaining error-free records	,757				
Making customers feel safe in their transactions	,703				
Visually appealing materials associated with service	,679		,447		
Employees who instill confidence in customers	,665				
Employees who are consistently courteous	,624				
Convenient business hours	,455				,666
Keeping customers informed	,449			,655	
Modern equipment (e.g. trucks, SAP)	,440		,441		,553
Sales persons who have a neat, professional appearance	,434		,716		
Factor II (α = ,833)					
Knowledgeable employees		,765			
Giving customers individual attention		,732			
Employees who deal with customers in caring fashion		,628	,454		
Ability to respond to customer's request		,623			
Willingness to help customers		,575			
Prompt customer service		,496			
Having the customer's best interests at heart		,494	,610		
Factor III (α = ,844)					
Visually appealing offices			,758		
Factor IV (α = ,797)					
Dependability in handling customers' service problems				,732	
Providing customer service as promised				,696	
Employees who understand the needs of their customers				,581	
Performing customer service right the first time				,439	,719
Factor V (α = ,781)					
Providing customer service at the promised time					,752
Eigenvalues	8,203	2,351	1,704	1,185	1,091
% of variance explained	37,286	10,688	7,747	5,389	4,960
Cumulative % of variance explained	37,286	47,974	55,721	61,110	66,070

Extraction Method: Principal Component Analysis. □ Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 28 iterations.

TABLE 35: ROTATED COMPONENT MATRIX OF DESIRED SCORES (E)

Rotated Component Matrix[a]

	Component			
	1	2	3	4
Factor I (α = ,855)				
Having the customer's best interests at heart	,780			
Employees who understand the needs of their customer	,720			
Knowledgeable employees	,658			
Employees who deal with customers in caring fashion	,579	,416		
Giving customers individual attention	,545	,438		
Making customers feel safe in their transactions	,529			,437
Employees who instill confidence in customers	,484		,485	,446
Maintaining error-free records	,457			,567
Ability to respond to customer's request	,446			,465
Factor II (α = ,883)				
Providing customer service at the promised time		,729		
Dependability in handling customers' service problems		,724		
Providing customer service as promised		,712		
Performing customer service right the first time		,676		
Keeping customers informed		,662		,536
Prompt customer service		,569		,494
Factor III (α = ,835)				
Modern equipment (e.g. trucks, SAP)			,782	
Sales persons who have a neat, professional appearan			,727	
Visually appealing offices			,714	
Convenient business hours			,545	
Visually appealing materials associated with service			,444	
Factor IV (α = ,883)				
Willingness to help customers				,758
Employees who are consistently courteous				,648
Eigenvalues	9,717	1,775	1,273	1,103
% of variance explained	44,170	8,070	5,788	5,012
Cumulative % of variance explained	44,170	52,240	58,028	63,041

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 8 iterations.

TABLE 36: ROTATED COMPONENT MATRIX OF PERCEIVED SCORES (P)

Rotated Component Matrix[a]

	Component				
	1	2	3	4	5
Factor I (α = ,855)					
Visually appealing offices	,775				
Sales persons who have a neat, professional appearanc	,760				
Modern equipment (e.g. trucks, SAP)	,720				
Convenient business hours	,667				
Employees who are consistently courteous	,660				
Visually appealing materials associated with service	,653				
Employees who instill confidence in customers	,418			,460	
Factor II (α = ,870)					
Providing customer service as promised		,798			
Dependability in handling customers' service problems		,766			
Performing customer service right the first time		,716			
Providing customer service at the promised time		,621	,491		
Keeping customers informed		,546	,406		
Employees who deal with customers in caring fashion		,513			
Giving customers individual attention		,419			,592
Prompt customer service		,418	,501		
Factor III (α = ,824)					
Maintaining error-free records			,825		
Making customers feel safe in their transactions			,576	,450	
Knowledgeable employees			,473	,531	
Factor IV (α = ,697)					
Willingness to help customers				,718	
Ability to respond to customer's request				,599	
Factor V (α = ,738)					
Having the customer's best interests at heart					,776
Employees who understand the needs of their customer					,617
Eigenvalues	7,686	2,433	1,263	1,211	1,000
% of variance explained	34,935	11,061	5,742	5,503	4,546
Cumulative % of variance explained	34,935	45,996	51,738	57,242	61,788

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

TABLE 37: ROTATED COMPONENT MATRIX OF GAP SCORES (MSS)

Rotated Component Matrix[a]

	Component				
	1	2	3	4	5
Factor I (α = ,838)					
Visually appealing offices	,797				
Sales persons who have a neat, professional appearan	,790				
Visually appealing materials associated with service	,716				
Employees who are consistently courteous	,590				
Modern equipment (e.g. trucks, SAP)	,562				,479
Convenient business hours	,502				,622
Employees who deal with customers in caring fashion	,427	,509			
Factor II (α = 8,43)					
Employees who understand the needs of their customer		,770			
Knowledgeable employees		,733			
Having the customer's best interests at heart		,660			
Giving customers individual attention		,597			
Ability to respond to customer's request		,563			
Willingness to help customers		,471		,437	
Factor III (α = ,776)					
Providing customer service as promised			,819		
Dependability in handling customers' service problems			,790		
Performing customer service right the first time			,552		
Providing customer service at the promised time			,458		,506
Prompt customer service			,439	,486	
Factor IV (α = ,769)					
Making customers feel safe in their transactions				,779	
Employees who instill confidence in customers				,610	
Keeping customers informed				,478	
Factor V (α = ,686)					
Maintaining error-free records					,780
Eigenvalues	7,553	2,287	1,374	1,147	1,068
% of variance explained	34,331	10,396	6,244	5,216	4,854
Cumulative % of variance explained	34,331	44,727	50,971	56,187	61,040

Extraction Method: Principal Component Analysis. □ Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 8 iterations.

TABLE 38: ROTATED COMPONENT MATRIX OF GAP SCORES (MSA)